UNIVERSIDADE ESTADUAL DO OESTE DO PARANÁ
PROGRAMA DE PÓS-GRADUAÇÃO EM ADMINISTRAÇÃO
MESTRADO PROFISSIONAL

WESTERN PARANÁ STATE UNIVERSITY
PROFESSIONAL MASTER'S IN ADMINISTRATION

O PAPEL DA UNIVERSIDADE ESTADUAL DO OESTE DO PARANÁ NO ECOSSISTEMA DE INOVAÇÃO DA REGIÃO OESTE DO PARANÁ

THE ROLE OF THE STATE UNIVERSITY OF THE WEST OF PARANÁ IN THE INNOVATION ECOSYSTEM OF THE WEST PARANÁ REGION

[TRADUÇÃO INGLESA]

CATHIA PETRANSKI CORRÊA

CASCAVEL

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Dissertation presented in partial fulfilment of the requirements for the degree of **Master of Science in Administration** in the Department of Administration, Western Paraná State University.
Dissertation Supervisor: Drª. Sandra Mara Stocker Lago.

Dissertação apresentada ao Programa de Pós-Graduação em Administração (PPGAdm) – Mestrado Profissional, da Universidade Estadual do Oeste do Paraná, como requisito parcial para obtenção do grau de **Mestre em Administração**.
Orientadora: Professora Doutora Sandra Mara Stocker Lago.

CASCAVEL

2021

International Cataloging-in-Publication Data
UNIOESTE Library System

Corrêa, Cathia Petranski.
The role of the State University of the West of Paraná in the innovation ecosystem of the west Paraná region. [TRADUÇÃO INGLESA] / Cathia Petranski Corrêa; Supervisor: Sandra Mara Stocker Lago; [Translation of Karin Elizabeth Rees de Azevedo], 2021.
126 f.

Dissertation (Degree in of Master of Science in Administration) – Department of Administration, Western Paraná State University, 2021

[English version of: O papel da Universidade Estadual do Oeste do Paraná no ecossistema de inovação da região oeste do Paraná.]

1. Innovation and Entrepreneurship. 2. Innovation Ecosystem. 3. Sustainability. 4. University. I. Lago, Sandra Mara Stocker. II. Azevedo, Karin Elizabeth Rees de. III.Title.

unioeste
Universidade Estadual do Oeste do Paraná

CATHIA PETRANSKI CORRÊA

O papel da Universidade Estadual do Oeste do Paraná no ecossistema de inovação da região Oeste do Paraná

Dissertação apresentada ao Programa de Pós-Graduação em Administração em cumprimento parcial aos requisitos para obtenção do título de Mestra em Administração, área de concentração Competitividade e Sustentabilidade, linha de pesquisa Sustentabilidade, APROVADO(A) pela seguinte banca examinadora:

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Cascavel, 18 de março de 2021

RESUMO

Corrêa, C. P. (2021). ***O papel da Universidade Estadual do Oeste do Paraná no ecossistema de inovação da região oeste do Paraná***. Dissertação de mestrado, Universidade Estadual do Oeste do Paraná, Cascavel, PR, Brasil.

A inovação vem ocupando um espaço fundamental para o crescimento e desenvolvimento socioeconômico, além de ser capaz de proporcionar a criação de novos modelos de negócios, e atender às necessidades dos diversos tipos de consumidores. Ela incentiva conhecimentos científicos e tecnológicos, propicia diferentes maneiras eficazes de competição em espaços empresariais e a formação de ambientes de cooperação de forma empreendedora, chamados de Ecossistema de Inovação, que estimulam a criação de projetos inovadores e a troca de experiências produtivas, de forma sinérgica entre os atores envolvidos. Situam-se nesse ambiente, governo, universidades, indústrias, instituições de suporte, empreendedores, sistema financeiro, clientes e a sociedade. Neste contexto, a universidade assume o papel de contribuir com o desenvolvimento econômico, social e cultural a partir da produção de pesquisas que objetivam a geração de resultados para as organizações, propiciam novos conhecimentos aplicáveis e formam novos empreendedores. No entanto, seu papel vai além do ensino e da pesquisa, pois ela passa a assumir uma terceira missão quando se propõe a desenvolver sua região por meio de inovações tecnológicas. Dessa forma, a universidade destaca-se como um dos principais atores dentro de seu ecossistema. Portanto, o objetivo deste estudo foi compreender qual o papel desempenhado pela Universidade Estadual do Oeste do Paraná dentro do Ecossistema de Inovação da região Oeste do Paraná para que possa solucionar problemas e atender às necessidades sociais da região. O estudo caracteriza-se como exploratório e descritivo. Os procedimentos são bibliográficos e documentais e a abordagem é qualitativa. Com o objetivo de estruturar a parte teórica desta pesquisa, foi realizada uma revisão sistemática de literatura em busca de bibliografias nacionais e internacionais. Para o levantamento de dados primários, contou-se com a aplicação de um roteiro semiestruturado com questões abertas destinadas aos atores envolvidos no Ecossistema da região Oeste do Paraná. Como resultados, pode-se alcançar o objetivo proposto do presente estudo, o qual demonstrou as diversas ações empreendedoras executadas pela universidade. O estudo também trouxe como resultados alguns desafios e fatores condicionantes os quais acabam impactando na cooperação Universidade/Empresa e, por fim, foram apresentadas ações práticas propostas para o fortalecimento da UNIOESTE a fim de contribuir para o desenvolvimento regional de maneira sustentável dentro do Ecossistema de Inovação da região Oeste do Paraná.

Palavras-chave: Inovação, Ecossistema de Inovação. Universidade. Sustentabilidade. Empreendedorismo.

ABSTRACT

Corrêa, C. P. (2021). ***The role of the State University of the West of Paraná in the innovation ecosystem of the west Paraná region***. Master's degree dissertation, Western Paraná State University, Cascavel, PR, Brazil.

Innovation has taken part of an essential part for growth and socioeconomic development. In addition, it is able to provide the creation of new business models, and to fulfill the needs of different kinds of consumers. It encourages scientific and technological knowledge, it provides different effective ways of competition in business fields and the generation of entrepreneurial cooperation environments, called Innovation Ecosystem, which stimulate the creation of innovative projects and the exchange of productive experiences, synergistically among the actors involved. The government, universities, industries, support institutions, entrepreneurs, financial system, customers and society are in this environment. In this context, the university assumes the role of contributing to economic, social and cultural development according to the research production, which aims at generating results for organizations, providing new applicable knowledge and training new entrepreneurs. However, its role goes beyond teaching and researching, as it takes on a third mission when it proposes to develop its region based on technological innovations. Thus, the university stands out as one of the main actors within its ecosystem. Therefore, this study aimed at understanding the role played by the Western Paraná State University in the Innovation Ecosystem of the Western Paraná region in order to solve problems and meet the social needs of this region. The study is characterized as exploratory and descriptive. The procedures are bibliographic and documentary and the approach is qualitative. In order to structure the theoretical part of this research, a systematic literature review was carried out by searching on national and international bibliographies. For the survey of primary data, a semi-structured script with open questions was applied to the actors that made part of the ecosystem of western Paraná. As results, it is possible to reach the proposed objective of the present study, which has shown several entrepreneurial actions carried out by the university. This study also induced some challenges and conditioning factors as a result, which impacted on the University / Company cooperation. Finally, practical actions were suggested to improve UNIOESTE, and contribute to the regional development in a sustainable way within the Innovation Ecosystem of the western Paraná region.

Keywords: Innovation, Entrepreneurship, Innovation Ecosystem, Sustainability, University.

LIST OF FIGURES

LIST OF CHARTS

SUMMARY

LIST OF ACRONYMS

ACIC	Commercial and Industrial Association of Cascavel
ANPROTEC	Brazilian National Association of Promoters of Innovative Enterprises
BDTD	Brazilian Digital Library of Theses and Dissertations
CAPES	Coordination for the Improvement of Higher Education Personnel
CE	Creative Economy
CETQT	Technology Center for the Chemical and Textile Industry
CME	Municipal Business Condominium
CNPJ	National Register of Legal Entities
CNPQ	National Council for Scientific and Technological Development
COOPAVEL	Agroindustrial Cooperative of Cascavel
EMPRAPA	Brazilian Agricultural Research Corporation
EU	Enterprise University
FACIMAR	Municipal faculty of Marechal Cândido Rondon
FACISA	Municipal Faculty of Foz do Iguaçu
FACITOL	Municipal faculty of Toledo
FAG	Assis Gurgacz Foundation
FDC	Dom Cabral Foundation
FECIVEL	Municipal College of Cascavel
FUNDEP	Foundation for Research Development
FUNDETEC	Foundation for Scientific and Technological Development
HEI	Higher Education Institution
HUOP	Western Paraná University Hospital
IBICT	Brazilian Institute of Information in Science and Technology
ICT	Information & Communication Technology
ITP	Iguaçu Technological Park
MHDI	Municipal Human Development Index
NASDAQ	National Association of Securities Dealers Automated Quotations
NIS	National Innovation System
NUPEACE	Nucleus for Advanced Research in Business Administration, Accounting, and Economic Sciences
PDCA	Plan, Do, Check, Act

POD	Western Developing Program
PRAF	Pro-Rectory of Business Administration and Finance
PROINTEC	Electronics Valley Technological Park
PUCPR	Pontifical Catholic University of Paraná
PUCRJ	Pontifical Catholic University of Rio de Janeiro
PUCRS	Pontifical Catholic University of Rio Grande do Sul
RAI	Business Administration and Innovation Journal
RENI	Business and Innovation Journal
RIS	Regional Innovation System
RUE	Ranking of Entrepreneurial Universities
RUF	Folha University Ranking
S&I	Science and Innovation
S&T	Science and Technology
SEBRAE	Brazilian Service of Support to Micro and Small Enterprises
SEDECTES	Secretariat for Economic Development, Science, Technology, and Higher Education of the State of Minas Gerais
SENAC	National Service of Commercial Learning
SENAI	National Service of Industrial Learning
SESI	Industry Social Service
SIS	Sectorial Innovation System
SLR	Systematic Literature Review
SPELL	Scientific Periodicals Electronic Library
SWOT	Strengths, Weaknesses, Opportunities and Threats
TECNOPUC	Technological Park of the Pontifical Catholic University
TH	Triple Helix
THE	Times Higher Education
TIC	Technological Innovation Center
UEL	State University of Londrina
UEPA	State University of Pará
UFPE	Federal University of Pernambuco
UFRJ	Federal University of Rio de Janeiro
UFSC	Federal University of Santa Catarina
UFSM	Federal University of Santa Maria
UNI	Innovative Business Plant

UNICAMP	University of Campinas
UNICENTRO	Midwestern State University
UNIFRAN	Franca University
UNIMED	National Confederation of Medical Cooperatives
UNIOESTE	State University of Western Paraná
USP	University of São Paulo
UTFPR	Federal Technological University of Paraná

1 INTRODUCTION

Companies are increasingly competitive due to the constant growth of the global scenario because of competition, the high levels of uncertainty about the future, the increase in productivity between countries, and greater demands from consumers. In this context, innovation plays a crucial role in socioeconomic growth and development and contributes to the survival of both people and companies. It can propitiate the creation of new business models, meet new consumer needs, create new organizational models, encourage scientific and technological knowledge, and, above all, leverage effective ways to compete in the business environment based on products, services, and value generation. However, innovating is a challenge and not everyone is prepared for change, often because they have an outdated vision, or even by pure ignorance.

When facing such a scenario, individuals from Universities, Companies, and Government perceived a great opportunity for growth and regional development in a more accelerated manner, through cooperation among the organizations of the region where they are located, making the environments collaborative and innovative. In these environments, everyone works for common growth and strengthening, allowing the exchange of experiences, new discoveries, and sharing results. This cooperation is called "Innovation Ecosystem". (Adner, 2017; Adner & Kapoor, 2016; Frenkel & Maital, 2014).

Innovation Ecosystems are characterized by being environments that stimulate entrepreneurship, based on the development of innovative projects that contemplate the exchange of productive experiences and knowledge in a synergic way among the stakeholders (Spinosa, 2015).

Organizations view these innovative environments positively and seek to train or hire professionals with the most diverse inventive skills so that they are able to generate new results both in the internal and external environment. Thus, interaction is expected between companies regarding the diversification of their skills in order to favor mutual growth among all enterprises (Brazilian Service of Support to Micro and Small Enterprises - SEBRAE, 2018).

There are several advantages that an innovation ecosystem can provide to a region in which it is inserted, including regional strengthening to provide its development, and building trust with the community at large (Sebrae, 2018).

Innovation takes on a significant and broad role and aims to create new arrangements among the institutions that generate the conditions for its implementation, that is, these organizations are concerned with the structural system of "innovation in innovation" from the so-called Triple Helix, which involves a set of organizations and contemplates the cooperation between Universities, Companies and Government, in order to enhance the conceptual and empirical dimensions of innovation, and improve innovation policies at regional and national levels (Etzkowitz, 2009).

In this context, the university undergoes changes and undertakes the role of providing opportunities for economic, social, and cultural development in the reproduction of research focused on organizations (Etzkowitz, 2009). In addition, new applicable knowledge is generated, and new entrepreneurs are formed, thus, the university starts to be called an Entrepreneurial University (Casado, Siluk, and Zampieri, 2012).

To generate the continuity of these cooperative innovation environments, innovation habitats arise as part of the innovation ecosystem called Technological Parks, as they have an essential role in regional development. "Entrepreneurs seek these environments to establish cooperation with universities and research centers, sharing knowledge and developing innovation projects" (Da Silva, De Sá, Spinosa, 2019, p. 32).

After contextualizing and understanding Innovation Ecosystems, Cooperation between Universities and Companies, and Entrepreneurial Universities, it was possible to reach the central focus of this study, the role played by the State University of Western Paraná within the Innovation Ecosystem of Western Paraná. It is assumed that the university has an important role for the sustainable development of the region, starting to be seen as a support structure for innovation and its entrepreneurial practices.

1.1 RESEARCH PROBLEM

For a country or a region to develop, it is essential to have interaction among innovation players, such as companies, universities, public agencies and others. Therefore, it is necessary to understand how this interaction occurs and whether it actually contributes to the development of a country or region.

The delimitation of spaces or territories and the identification of innovation actors in this context contribute to creating solutions to problems and meeting the social needs of a given region. There is also the valorization of culture, habits, values, history, and specificity of the place, because each location has different needs and characteristics and can contribute in

different ways to regional, national, and even international technological advances (Cário, Lemos, Bittencourt, 2016). The actors involved in the innovation process need to have the scientific, technical, structural, economic, and regulatory capacity to generate innovation.

However, an isolated agent, be it a company, government institution, startup, or university, does not contemplate all these factors within its unit. They need to resort to other agents, even their own competitors, for innovation and regional development to be made possible. There is also an interaction of knowledge, since there is no innovation without this factor (Schmitz, Delgado, Mezzaroba, Dandolini, De Souza, 2015).

In Brazil, there are many efforts to keep up with the advances that happen in developed countries regarding innovation. Some regions have been showing good results due to the increase of policies directed to science, technology, and innovation, building regional development strategies, once entrepreneurs, governors, and the scientific community agree that progress stems from these efforts (Spinosa, Krama, Hardt, 2018). This progress has resulted in the formation of Innovation Ecosystems, which are networks of actors with capabilities related to an innovative idea, which together are able to produce complex and specific innovations. They are capable of bringing improvements to the region where they are located, since they use resources from this environment to meet the specific needs of their locality and thus create successful results (Ferdinand & Meyer, 2017).

Urban environments are favorable for the formation of these Ecosystems in a sustainable way, not only in the social and economic issue, but also cultural, environmental, and territorial (Spinosa & Moura, 2013). When it comes to a city of reasonable size, environments can support a technological, social, cultural, economic, and scientific infrastructure, since urban centers hold information and produce and value knowledge (Spinosa *et al*., 2018).

In this environment, sustainability is a factor that cannot be disregarded as innovative, since it comprises a set of rules for the use of resources that seek to meet human needs. This term was mentioned in 1987 in the *Brundtland* Report of the United Nations Organization with the following determination regarding sustainable development: "it meets the needs of the present without compromising the ability of future generations to meet their own needs", considering environmental, economic, and social sustainability (Torressi, Pardini, Ferreira, 2010).

Regarding the importance of the interaction between innovation actors such as universities, government, and companies, both for local and regional development, as well as for national development, the need for continuity of the activity is evident. In view of this, it was decided to conduct a study in order to verify the interaction of the State University of

Western Paraná in the Innovation Ecosystem existing in the Western Paraná region. To this end, it is necessary that the players involved in an Innovation Ecosystem have the scientific, technical, structural, economic, and regulatory capabilities to generate innovation. Based on this assumption, this study aims to answer the following research question: **What has been the role played by the State University of Western Paraná within the Innovation Ecosystem of the Western Paraná region?**

1.2 OBJECTIVES

The central focus of this dissertation is the contribution of the State University of Western Paraná in the Innovation Ecosystem of the Western Paraná region.

1.2.1 General

In general, this study aims to understand what role has been played by the State University of Western Paraná within the Innovation Ecosystem of the Western region of Paraná.

1.2.2 Specifics

In order to achieve the general objective of this study, the specific objectives are exposed below:

a) Describe the innovation ecosystem of the Western region of Paraná and its relations with the actors and their roles involved in these practices;
b) Identify the entrepreneurial practices of the State University of Western Paraná related to the development of the Innovation Ecosystem of the Western region of Paraná;
c) Relate the challenges and conditioning factors of the university's performance in the innovation ecosystem;
d) Suggest practical actions that contribute to the university to strengthen its role within the innovation ecosystem.

1.3 RATIONALE AND CONTRIBUTION OF THE RESEARCH

To justify this study, we took into consideration the importance of the university's interaction with the other players involved in the innovation ecosystem and its capacity to undertake and thus contribute to the sustainable development of the region.

Audretsch and Link (2019) point out that the emergence of business-oriented innovation ecosystems in recent years portrays the importance of entrepreneurship played by universities, private companies, non-profit organizations, and by research institutions that turn ideas into innovations. However, entrepreneurship should not only start a new business or a new idea, but also develop the stakeholders' mindset and skills that are able to strengthen economic and social growth (Rice, Fetters, Greene, 2014). The university has a key role in generating entrepreneurial behavior for all those involved in the innovation ecosystem (Bittencourt, 2019).

An ecosystem supported by the university provides the synergy and connectivity of teaching, research, and extension, as well as it strengthens actions and intellectual stimulation throughout the system and covers both the internal and external communities (Feeters, Rice, Greene, 2010). There are some activities developed by entrepreneurial universities correlated to the development of the innovative ecosystem that always seek partnership with other support entities. Among the activities, we highlight the diversity of courses focused on entrepreneurship, innovative pedagogical materials and activities, partnerships with entrepreneurs and graduates with know-how to give lectures focused on entrepreneurship, development of new enterprises in the university itself, and providing entrepreneurial and innovative services for small companies. These practices can be performed by the State University of Western Paraná - UNIOESTE.

1.4 REPORT STRUCTURE

The dissertation, besides the introduction, is organized in six chapters, as can be seen in its structure (Figure 01).

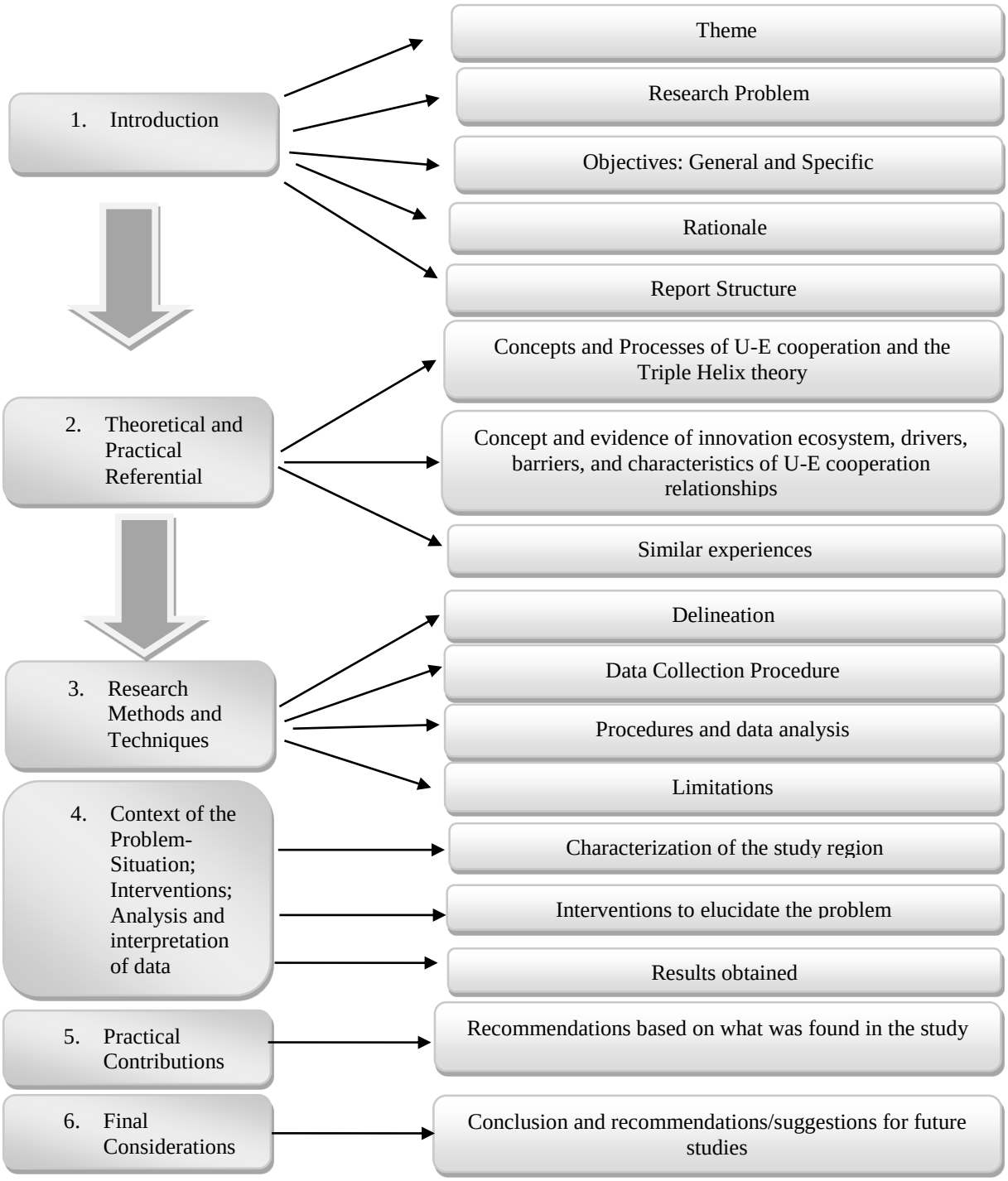

Figure 1. Dissertation Structure

Source: elaborated by the author (2020).

2 THEORETICAL AND PRACTICAL REFERENCES

This chapter presents the theoretical and empirical background that allows us to objectively understand the guidelines of this study. Before presenting the topics and main subjects addressed, it is necessary to conceptualize and understand the Innovation Ecosystem, its evolution, as well as the players and the importance of management for all those involved.

2.1 INNOVATION ECOSYSTEM

A brief understanding of Innovation Systems is necessary in order to report on its ecosystem.

2.1.1 Innovation Systems Concept

It was in the 1980s that the National Innovation System (NIS) began to emerge in various places such as Europe and the United States (Lundvall, 2007). When analyzing the Japanese system, Freeman (1989) conceptualized the NIS to the academic community to form a set of actors and institutions that represent the innovation process, whose result was the economic development through benefits provided by innovation and technology diffusion, according to the abilities of each country.

The NIS is linked to the development of new technologies, making innovation its primary factor. This system is composed of several actors that involve it, and among the three main ones are the State, Universities, and Companies, besides reflecting on political, economic, social, and cultural factors. According to the Committee for the Development of the Capital Market - CODEMEC (2016), the system faces several challenges and the main one goes beyond the generation and dissemination of the scientific knowledge produced, which is the transformation of this knowledge into technological innovation.

The NIS addresses the innovation process within a country, divided into three categories: first, the NIS itself, and then the Regional Innovation System (RIS), which has the same characteristics as the NIS, formed by a network of actors, which seek the innovative development of that region in which they are inserted, according to the Itaipu Technological Park (ITP), (2020). And the Sectoral Innovation System (SIS) is related to the specificity of a

certain sector, products and/or services, as for example, the energy sector that focuses on the development of innovation and technology of its area of activity (Figure, 02) (Paraol, 2018).

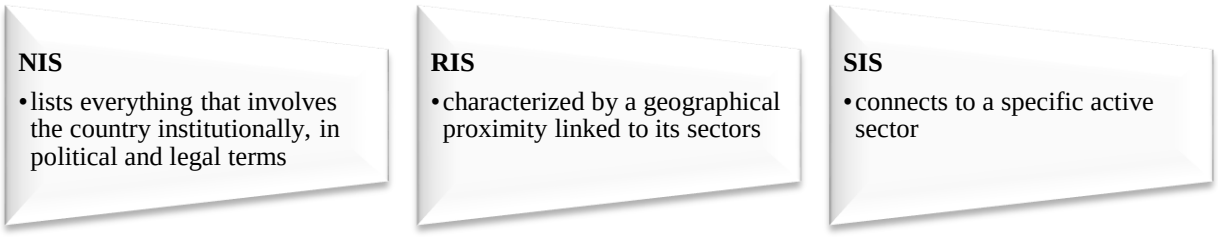

Figure 2. Innovation System Classification

Source: Prepared by the author (2020)

There are two main components of the innovation system: organizations, such as companies, universities, research centers, etc., and institutions that make up routines, laws, standards, rules, among others, responsible for the guidelines (Mezzourh & Nakara, 2012). However, some authors criticize the innovation system approach and claim there is no explanation regarding the innovation event and the innovation structure, highlighting the model as static. Thus, a more dynamic model was proposed, conceptualizing it by "Innovation Ecosystem", which was inspired by biology. Based on this biological concept, Moore (2016) describes evolutive processes of mutual interactions between beings that occupy the same environment; thus, the traditional model of innovation system was revised (Adner & Kapoor, 2010).

According to Moore (1993), in the administration field, an analogy is made between biology and the company, which can compose an ecosystem that will be interconnected with the other players, capable of generating innovations and sharing knowledge, and cooperating with the development of the others involved.

2.1.2 Concept of Innovation Ecosystem

The understanding of the Innovation Ecosystem is focused on the combination of several institutional players (Adner, 2006; National Research Council, 2007), which are (a) companies, (b) universities, (c) investors, and (d) government.

a) Companies: responsible for developing new products and services;

b) Universities: responsible for disseminating knowledge and transferring technology;

c) Investors: responsible for investing in actions for the development of a given organization and/or startups;
d) Government: administers and regulates the state, companies, and universities.

From the Innovation Ecosystem, institutions have perceived opportunities for growth and development of the organizations and the region where they are located in a faster way through the creation of collaborative and innovative environments, where everyone works together. This allows exchanging experiences, new discoveries, and the sharing of results. They also stimulate entrepreneurship, from the development of innovative projects that contemplate the exchange of productive practices and knowledge, in a synergic way among the various agents involved (Spinosa, 2015).

Companies that see the Innovation Ecosystem as an advantage positively seek the professional qualification of their employees so that they are able to innovate and bring new satisfactory results for the organization (Sebrae, 2018). It is also noteworthy that a healthy and balanced Ecosystem is one that brings profit to the commercial economy in which it is inserted, demonstrating that the resources invested bring return through innovation (Kon, 2016).

In this context, the university assumes the role of providing economic, social, and cultural development in the reproduction of scientific and technological research in order to contribute to the positive results of the organizations' innovations (Etzkowitz, 2009).

With this in mind and understanding the importance of the innovation ecosystem in the global scenario, the main issues to be discussed in the referential were listed, in order to encompass the necessary knowledge to theoretically support the development of this study and achieve the proposed objectives.

The Innovation Ecosystem concept is linked to two economies: the first concerns the research economy, which seeks constant development of new knowledge and technologies, depending on public resources for its development. The second is the commercial economy, which is directly linked to the practical actions of the market and depends on private initiative (Bittencourt, 2019).

Innovation ecosystem is a term used to report complex networks from which complex innovations emerge. This nomenclature originated in the comparison with Ecology's environmental ecosystem, which, in a given space, living beings dependent on that ecosystem can come together to survive. This also happens when in a delimited space several agents or actors able to produce specific innovations come together and use their own resources from their means and ends relationships, strictly necessary for the innovation to happen (Ferdinand & Meyer, 2017).

Thus, the members operate in different ways, at different stages. The main characteristic is the grouping of players with geographical proximity, in a collaborative and open manner. In general, this environment includes government, universities, industry, support institutions, entrepreneurs, the financial system, customers, and society (Neto, De Matos, Ehlers, Teixeira, 2018). In complement, Ferdinand, and Meyer (2017, p. 4) conceptualize the term adapted from ecology as "a network of interconnected organizations, linked to a focal enterprise or platform that incorporates production and use side participants, and creates and appropriates new value through innovation."

Therefore, the idea that the network arises from a company is characterized. The starting point is the focus of the ecosystem, which, in turn, presents itself as one of the main actors, whose purpose is to propose the innovation to be carried out. Thus, it will relate with other actors with similar properties, and which can contribute to the success of this innovation and add value to it (Ferdinand & Meyer; 2017).

Strong collaboration also takes place between companies and customers, both significant players within the ecosystem since they operate as users and quality controllers. This enables companies to use their experience, through complaints and suggestions, to improve existing products or present new needs to meet customer expectations, thus generating more competitiveness and innovation. Likewise, collaboration can occur between the companies themselves, generating a transfer of knowledge, raw material supplies, and co-participation in the creation of innovations (Smorodinskaya, Russell, Katukov, Still, 2017).

Another important actor in the Innovation Ecosystem is the university, whose role goes beyond teaching and research, for it begins to assume a third mission, which is to develop its region through technological innovations. In this way, the university stands out as one of the main actors within its ecosystem. Thus, such institutions contribute with the supply of specialized professionals for the labor market, besides providing suitable environments to generate research with high levels of social relevance. There is no way to talk about technological and economic development without the participation of universities configuring and encouraging other actors, because their practices are crucial for local competitiveness through the dissemination of knowledge (Zuti, 2017).

The government is also an active player in the Innovation Ecosystem, since its power to control markets and the economy directly influences the demands of ecosystems, in addition to supervising activities and restricting irregularities. Furthermore, there is an interest in boosting regional and national development with public policies and tax incentives to accelerate the production of technology and innovation (Smorodinskaya et al., 2017).

Therefore, we may consider that people are the most important factor of the Innovation Ecosystem, and they are common to all the different actors, for they are the ones who possess the knowledge, talent, and qualifications required to transform needs and challenges into solutions. They also generate quality of life for the community to which they belong by building a direct relationship with the growth of the economy and development of their city and region. These people can be entrepreneurs, customers, suppliers, technical support providers, scientists, students, teachers, rulers, and politicians clustered in a place or region, engaged by innovation (Piqué & Audy, 2016). Figure 03 illustrates the Innovation Ecosystem model.

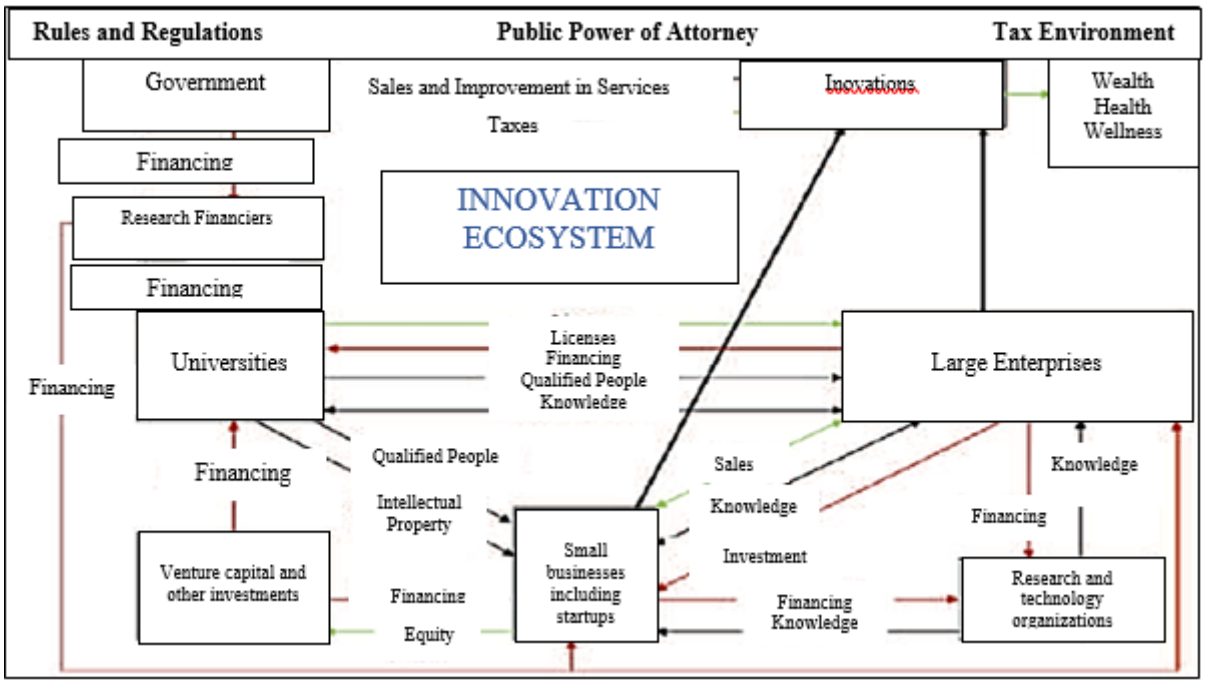

Figure 3. Innovation Ecosystem Model

Source: Adapted from Merkan and Goktas (2011, p. 107).

According to what Figure 03 illustrates, it is possible to see the interaction between government, university, and companies within the innovation ecosystem and the role that each one plays in this entrepreneurial and inovation environment.

2.1.3 Differences between Innovation Ecosystem and Innovation System

The traditional innovation system may be governed by public policies, whereas innovation ecosystems evolve as market changes occur (Merkan & Goktas, 2011). Authors Russo-Spena, Tregua, and Bifulco (2017) differentiated the two concepts (Chart 01).

Chart 1. Difference between innovation systems and ecosystems

		Innovation System	Innovation Ecosystem
Community of scholars		Politics; Economics; Innovation Economics.	Technological Innovation; Strategies and business; Economics and regional studies; Entrepreneurship.
Set of Key Concepts	Innovation (Focus)	Analysis and explanation regarding the change in technology and economic growth.	Understand the dynamics within companies and the network of economic and social innovation activities.
	Context	Limited in geographic space or specific industry.	It is neither physical nor industrial, but considered emergent and self-regulating, similar to a platform that provides modular resource structures for innovation.
	Actors	Economic, business, and institutional actors interact, but they keep their autonomies.	Interaction of interdependent businesses, economy, and institutional parties; and more attention to peripheral and distant relationships.
	Facilitators	Knowledge and learning favored by the institutions.	Knowledge and technology blended and driven to a balanced approach based on cross-fertilization.
	Governance	Nature-dependent path, with a crucial role played by institutions.	Resulting from the interaction of deliberate and unforeseen processes, led by business through a dialectical negotiation process.
Main ontological position		A complicated set of diverse actors, connecting within a set of predictable interactions aiming at equilibrium and depending on clear and established rules.	Complex set with multiple actors, but with multiple unpredictable interactions, measured by knowledge, in a state of disequilibrium. Rules are adjusted over time and based on the tolerance of disequilibrium to transmit innovation.

Source: Adapted from Russo-Spena, Tregua, and Bifulco (2017).

Researchers and entrepreneurs began to see the innovation ecosystem as an advantage for acquiring new knowledge, for innovating, and for obtaining new technologies by sharing instead of individualism (Schwartz & Bar-El, 2015).

The actors in an ecosystem include resources such as material and human capital. Another characteristic that stands out is that the entities are installed geographically in a strategic manner, according to a specific technology. An example of this is Silicon Valley in the USA (Hwang & Horowitt, 2012) and the Porto Digital in Recife-PE, in Brazil.

2.1.4 The largest Innovation Ecosystems worldwide

According to Furtado (2015) regarding the world's largest innovation hubs, which are home to the world's largest technology companies, major names of importance to the world economy stand out, including:

a) Silicon Valley, in the United States of America (USA) - Located in the state of California, south of the San Francisco Bay, in a region recognized as the world's technological hub, for housing large companies in the technology area since the 1950s. It is the revolution of technology, especially when it comes to the Internet.

b) Tel Aviv in Israel - Israel started its investments in technological capital in the 1990's with the purpose of debureaucratizing and developing the country in an entrepreneurial way, through the interaction between universities and companies. The country invested a lot in research and development (4.5% of GDP), this way, Israel attracted big companies, such as Intel, Google, General Electric, and Cisco, becoming the second world power after the USA. It has more startups according to the listing of the American stock exchange National Association of Securities Dealers Automated Quotations (NASDAQ) and the areas of major investments are internet, software, communication, healthcare, semi-conductors, and cleantech.

c) Bangalore - It is considered one of the ten most entrepreneurial cities in the world and the third largest city in India. It is known as "Silicon Valley", due to the start-up that occurred in the country's economy through software startups since the 1980s. Such incentive has provided interaction between government, university, and companies so that research can be carried out and qualified professionals can be developed.

d) Japan - It has several research centers that concentrate most of the studies in robotics, mechanics, and microelectronics. One of the best-known centers is the technopole, known as the Tsukuba Science City, which accommodates a university and advanced technology institutes. The Japanese culture values both the quality of life and the development of the country, besides all the government support and encouragement it receives in this area of education. Several companies have originated in Japan, for example: Sony, Nikon, Toshiba and Panasonic, Honda, Toyota, and Mitsubishi, making it a major exporter of electronics, automobiles, machinery, and other products.

e) Singapore - Due to its potential for technological development, today Singapore is considered the biggest growth pole in Asia and is an export platform for electronic

equipment. It has total free wi-fi coverage in its territory. Microsoft and IBM are among the most famous companies installed in the country.

According to the survey conducted by Innovation Leader, there are fifteen major cities that are at the forefront of innovation. Some factors were considered for the formation of the ranking, such as: the presence of startups and venture capital funding; top universities; fairs and conferences that usually bring together many people; headquarters of large companies with global reach; companies with innovation centers; coworking spaces and programs that help foster the formation of new ideas; economic competitiveness of the country, and government support for entrepreneurship and innovation infrastructure (Consumidor Moderno, 2019).

First in the ranking is Beijing in China, considered the world's second largest economy. In a report conducted by the Municipal Development and Reform Commission of the Chinese capital, 300 major construction projects were listed in the city. One hundred of them were related to "cutting-edge technology industries" with an estimated investment of $35 billion. The second place is London, which has motivated investor confidence, accommodating large companies such as Lloyd's, HSBC Holdings, and Barclays, which contemplate innovation. Tel Aviv is the third place, concentrating more than 350 multinationals from all sectors. Next, the other world innovation centers are Singapore - 4th; Shanghai, China - 5th; Stockholm, Sweden – 6th; Bangalore, India – 7th; Amsterdam, Netherlands – 8th; Tokyo, Japan – 9th; Berlin, Germany – 10th; Seoul, South Korea – 11th; Basel, Switzerland – 12th; Shenzhen, China – 13th; Dubai, Arab Emirates – 14th; Jakarta, Indonesia – 15th (Consumidor Moderno, 2019).

2.1.5 Innovation Ecosystems in Brazil

In Brazil, there are seven technological poles that stand out as Brazilian Silicon Valleys (Figure 04). For this, three main factors are considered: proximity to academic centers; fostered commercial and industrial area; and investments in startups by angel investors. The clusters are listed on the map below and described in the sequence (Pluga.Co, 2017):

Figure 4. Map of the Brazilian Silicon Valley

Source: Pluga.co (2017).

a) Porto Digital Technology Park, founded in 2000 in the city of Recife. It is considered one of the main technology parks and innovation environments in Brazil. It represents the new economy of the state of Pernambuco; it operates in the areas of software and services of Information and Communication Technology (ICT) and Creative Economy (CE), with emphasis on the segments of games, cine-video-animation, music, photography, and design. It also operates in the urban technology sector as a strategic area. It is a national reference, for the interaction between university, company, and government (Triple Helix), the Port was considered by the National Association of Promoters of Innovative Enterprises (ANPROTEC), in 2007, 2011, and 2015, the best technology park in Brazil.

b) San Pedro Valley Technology Park or San Pedro Valley is one of the main Brazilian startup communities, born in the São Pedro neighborhood in Belo Horizonte. There is a constantly growing ecosystem formed by industries, entrepreneurs, educational institutions, government, banks, investment funds, business and idea accelerators, fostering entities, among other agents. The San Pedro Valley emerged in 2011, and currently brings together more than 200 startups (Carvalho, 2018). With the potential that the region presents, the Secretariat of Economic Development, Science, Technology, and Higher Education of the State of Minas Gerais (SEDECTES) focuses on the startup acceleration program for entrepreneurs from all over the country who seek to implement their businesses in Minas Gerais.

c) Rio de Janeiro Technology Park, founded in 2003, covers approximately 350 thousand square meters within the University City Island and consists of research centers for innovative companies, laboratories, and spaces for entrepreneurship development in the city of Rio de Janeiro. The Park is a UFRJ project that houses research centers, large national and multinational companies, small and medium-sized startups, and ten laboratories of UFRJ itself. It includes the Institute for Innovation in Biosynthetics and Fibers of the National Service for Industrial Learning (SENAI), the Technology Center for the Chemical and Textile Industry of SENAI (CETQT), the MJV Innovation Laboratory, a pioneering company in the use of Design Thinking in the country, and the technology center of Benthic, a global leader in off-shore geotechnical investigations and geoscience consulting. UFRJ also has a coworking environment, venues for events, and entrepreneurship projects for academics and faculty. It invests heavily in attracting new companies from the most varied sectors of the economy and in the overflow of its activities beyond its physical borders. It has several partnerships with other national and international innovation ecosystems, including the one with Tecnopuc and Porto Digital in Recife (PE) for the exchange of resident organizations and the one signed with Tsinghua University Science Park (TusPark) of Tsinghua University, China, which allows the Park to have a permanent physical base in that country (Parque UFRJ, 2019).

d) Technology Park of the Electronics Valley (PROINTEC) is located in the city of Santa Rita do Sapucaí in Minas Gerais in a strategic area, between the main economic axis of the country, composed of Belo Horizonte, São Paulo, and Rio de Janeiro (Prointec, 2020). This is a municipal innovation program that develops several actions, such as: incubation of companies and technology-based projects; advanced incubation of companies; support for companies in the creative economy; encouragement of scientific and technological research; municipal innovation award; support for technology fairs and creativity. Besides this program, there are other initiatives such as Incentive to Attraction of Enterprises and Expansion of existing companies in the municipality. The Santa Rita do Sapucaí City Hall, through PROINTEC, aimed to provide more support to small and medium companies in the municipality and implemented the phase of Advanced Business Incubation with the creation of a post-incubation environment in a municipal business condominium (CME), whose main contribution of the CME is to encourage the installation of industries and generation of jobs and income in the municipality. Thus, already

established companies and new technology-based companies were attracted and sheltered in the areas of industrial electronics, electrical engineering, software development, telecommunications, precision mechanics, and companies that support their activities, such as packaging, tooling, and thermoplastic injection. The WEC participates in the Advanced Incubation Program and provides companies with greater support from the Municipal Administration, access to the research and development present in the incubation environment.

e) The São José dos Campos Technological Park (PqTec), considered the largest complex of innovation and entrepreneurship in Brazil, was born amid the "vocation" of the municipality of São José dos Campos, SP, to "be an advanced center of technological development and innovation". The concern about the future and the socioeconomic development of the municipality began in the 1990s; however, the discussion gained momentum in 2002, with the decision by the São Paulo state government to create the São Paulo System of Technology Parks. São José dos Campos was then one of the five municipalities to be part of the program (PqTec, 2020).

f) Parque Tecnológico Sapiens, located in the city of Florianópolis-SC, was inaugurated in 2006. It has an area of 4,315,680.88m². Due to the initiatives of four key players that directly influence the development of activities, namely government, business, academia, and society, the park develops its actions successfully. This is an innovation park that has its own infrastructure and houses several enterprises, projects, and other strategic innovative initiatives that contribute to the regional development. With an innovative model, it seeks to attract, develop, implement, and integrate initiatives, aiming to provide differentiated, sustainable, and competitive positioning. It seeks to unite the main economic segments of the region, such as tourism, technology, environment, and specialized services, besides providing innovation and sustainable development. Its structure was projected with the intention of stimulating the innovative spirit and cooperation among the players, besides being able to unite ideas and knowledge, transforming them into new products and services. The Park was planned to offer quality, excellence, and legal security to entrepreneurs and investors, besides having a differentiated infrastructure. The products and services provided aim to serve customers and partners living in the park so that they can develop and strengthen their businesses. Thus, the park also

develops, grows, enables, and qualifies environments that aim to meet the needs of all involved (Sapiens Parque, 2020).

g) TECNOPUC Technological Park started its installations in 2001, where 11.5 hectares were acquired from the army in the city of Porto Alegre-RS. Its second unit was installed in the city of Viamão-RS, in a building that was used as the headquarters of the municipality's Major Seminary. In 2004, it started to be used as a university campus. Nevertheless, in 2013, the university identified its entrepreneurial performance and the area's potential and then turned it into TECNOPUC's growth focus for the coming years. TECNOPUC aims to encourage research and innovation through the interaction between university, business, and government. Currently, it has two units and counts on more than 150 organizations in various fields, more than 6.5 thousand jobs, and large national and international partner companies. The main services offered include project management and negotiation through the interaction of university, companies, and government; specialized services such as consulting, advising, and auditing or the like, proof of concept service, prototype development, new venture project development and management, among many other services; intellectual property and technology transfer; startups; coworking; and internationalization program (Tecnopuc, 2020).

Because universities contemplate the entrepreneurial actions developed within the innovation ecosystems described above, the following topic deserves emphasis in this study.

2.2 ENTREPRENEURIAL UNIVERSITY

The role of universities, played in an entrepreneurial way, is a topic that has been discussed by several authors and can contribute to the innovation ecosystem development.

The first revolution in academia occurred at the end of the 20th century, in the USA. This fact was marked by the beginning of the university's participation in the market and contributed with the role not only of teaching, but also of developing research that favors the development of an economy. However, research needs resources, so some individual initiatives and even partnerships with companies were necessary (Etzkowitz, 2013). This is still a reality in the vast majority of universities worldwide. Yet, knowledge searching, and research has become so valuable that it has generated the second revolution of the academy, which becomes an actor responsible for socioeconomic development (Etzkowitz & Leydesdorff, 2000).

Then, as of the 1980s, 20th century, an increase in entrepreneurial activities was observed in North American universities, such as the emergence of incubators, technology parks, among others (Siegel, 2006). Nonetheless, it was at Stanford, in the 20th century, that the Entrepreneurial University model was consolidated (Etzkowitz, 2013). Since then, there has been an increase in entrepreneurial universities, especially in European universities (Bittencourt, 2019).

The Entrepreneurial University is understood for bringing knowledge and technological development to companies by means of innovation, through academic teaching models that reinvent themselves according to each market demand (Etzkowitz, 2013). It is capable of leveraging countless advantages, both for the university and for external development, and thus contributing to the increase in productivity and generation of new ventures, improving organizational practices and national and international competitiveness (Yousof & Jain, 2010).

Several authors have proposed theoretical models in order to clarify some characteristics of an "Entrepreneurial University". Clark (1998) considers that an entrepreneurial university comprises a set of institutional characteristics adapted and oriented towards entrepreneurial behavior, which are: (1) a committed central core; (2) a strong insertion in the surroundings; (3) diversification in revenue sources; (4) a stimulated academic heart; and (5) integration of the entrepreneurial culture. Chart 02 demonstrates some elements related to Clark's study.

Chart 2. Elements of Entrepreneurial Universities in Clark's studies.

Elements
Diversified income of the university (other sources from government, private companies, patents, associations of professionals, of former scholars, etc.).
Strengthened management capacity for development (at all hierarchical levels) with neither centralized nor decentralized administration.
Non-departmental research centers and outreach programs
Academic Center stimulated and modernized.
Engaging entrepreneurial culture - construction of a belief system that embraces the most material characteristics identified in the first four elements of transformation.

Source: Adapted from Clark (1998).

Etzkowitz and Leydesdorff (2000) state that the university performs entrepreneurial activities with the purpose of leveraging a country's economy and also to raise financial resources, based on the Triple Helix model. After some time, Etzkowitz (2004) conceptualizes the Entrepreneurial University in four factors: (1) interaction with industry and government; (2) independence, i.e., it is an institution totally independent from another; (3) Hybridization, the

university is able to accomplish several objectives at the same time; and (4) Reciprocity, of the university with industry, i.e., there is an exchange, a renewal that continues (Yousof & Jain, 2010). Table 03 presents elements related to Etzkowitz's study.

Chart 3. Elements of Entrepreneurial Universities identified by Etzkowitz

Principles	Definition
Interaction	The entrepreneurial university interacts closely with industry and government; it is not an ivory tower university isolated from society.
Independence	The entrepreneurial university is a relatively independent institution, not a creature dependent on another institutional sphere.
Hybridization	Resolving the tensions between the principles of interaction and independence is an impetus for creating hybrid organizational formats to accomplish both goals.
Reciprocity	Continuous renewal of the internal structure of the university, as its relationship with industry and government changes; and industry and government as they review their relationship with the university.

Source: Adapted from Etzkowitz (2004).

Spoorn (2001) brings a model of a university that is more flexible in its management and leadership, constantly adapting to changes and processes (Chart 04).

Chart 4. Elements of Entrepreneurial Universities identified by Spoorn (2001)

Elements	
Environmental demands can be defined as crisis or opportunity by the institution.	Universities need to develop clear mission statement and goals.
An entrepreneurial culture.	Shared governance.
A differentiated structure.	And committed leadership.
A professionalized management.	

Source: Adapted from Spoorn (2001).

Kirby (2006) goes further when he proposes strategic actions for the growth of the Entrepreneurial University, consisting of commitment, incorporation, implementation, communication, promotion, encouragement, and support, making it recognized, as can be seen in Chart 05.

Chart 5. Elements of Entrepreneurial Universities identified by Kirby (2006)

Elements	Definition
Endorsement	High ranking and senior staff serve as role models for others.
Incorporation	At the university, colleges/departments, and individuals.
Implementation	Targets monitored.
Communication	Publication and disclosure of the strategy and consultation on it.
Encouragement and support	Hard support (laboratories, pre-incubators, incubators, science parks, rooms, computer and office support, and financing). Soft support (training, guidance, and counseling, signaling sources of external support, and technical and managerial support).
Recognition	Participation in actions, promotions, etc.
and Rewarding	Interdisciplinary teaching and research groups, educational partnerships, multidisciplinary Entrepreneurship Center.
Organization	Business plan competitions, entrepreneurship "halls of fame", cases, etc.

Source: Adapted from Kirby (2006).

Rothaermel, Angung, and Jiang (2007) developed a model of Entrepreneurial University that departs from the traditional one. In this model, the authors highlight four factors: a research university; productivity in technology transfer environments; the generation of new companies; and innovation networks. The Entrepreneurial University is inserted into the university's innovation centers to promote new technologies through the creation of incubators and technology parks that interact with the market (Bittencourt, 2019).

Guerrero, Kirby, and Urbano (2006) chose Institutional Economics and the Resource-Based View to demonstrate the structure of an Entrepreneurial University according to its internal resources and capabilities and the formal and informal environmental factors that contribute to the transition from a traditional university to an Entrepreneurial University. Guerreiro and Urbano (2012) proposed a model in order to measure outcomes generated by the Entrepreneurial University, separated into formal factors that measure organizational structure and corporate governance, support measures for entrepreneurship and education, and informal factors, which measure attitudes of the university community towards entrepreneurship, entrepreneurial teaching methodologies, reward models and systems, and resources, human, financial, physical, and commercial capital, and partnerships, among others. This studied model is presented through a framework (Figure 05).

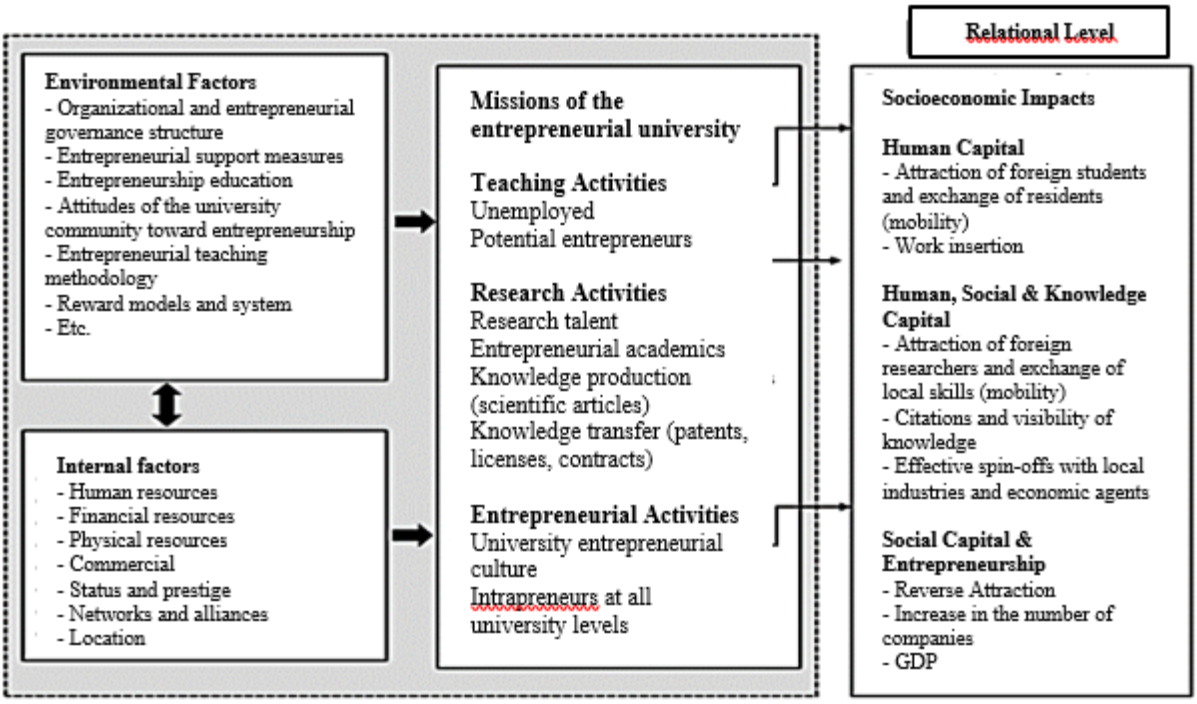

Figure 5. Entrepreneurial University Framework

Source: adapted from Guerrero; Urbano & Salamzadeh (2014).

Guerrero, Urbano, and Salamzadeh (2014) point out that it is important for an Entrepreneurial University to have a flexible and easily accessible management structure to minimize bureaucracy in order to facilitate the interaction between the actors of an Innovation Ecosystem, with measures that can contribute to and support the creation of new companies, research, technology transfer sectors, and incubators.

Aranha and Garcia (2014) bring the model that contemplates leadership, committed strategy, capitalization of innovative knowledge, economic and social development, creation of shared value, diversification of revenue sources, and integrated entrepreneurial culture in order to highlight the important role of the Entrepreneurial University. Times Higher Education (THE, 2019) highlights some factors that characterize an Entrepreneurial University capable of driving the innovative development of a society:

a) Provide technology parks, incubators, and/or accelerators;
b) Develop scientific research also focused on the solution of social problems and aimed at entrepreneurial businesses;
c) Develop an interaction between universities and companies;
d) Develop partnerships with international universities in order to generate research with other universities and exchange of their scholars;
e) Make partnerships with companies for R&D;

f) Allow companies to invest in the university to recruit and promote their brands;
g) Receive public and private investments;
h) Promote events aimed at entrepreneurship and;
i) Carry out university extension projects.

In a study conducted by Lemos (2012), at the University of Campinas (UNICAMP), the author demonstrates that the university has strong potential to act in entrepreneurial management processes guided by the ecosystem organization, based on a model of components presented in Chart 06. The UNICAMP's ecosystem model, focused on its activities, is synthesized in it.

Chart 6. Analytical Framework on Ecosystem-Driven Management

Categories and elements for defining the analytical framework for entrepreneurship management in universities			
Strategic and entrepreneurial management direction:		Resource configuration and training:	Interaction patterns between resources and capabilities:
Elements	Ecosystem perception	Identification and mapping	Combination and relationship.
	Commercialization regime	Hierarchization, selection, specification	Articulation, orchestration
	Entrepreneurial roles and strategies	Leveraging and transformation	Condition for the appropriation of results

Source: Lemos (2012, p. 200).

According to this model, it was possible to conclude that, based on the vision and practice of entrepreneurial companies, strategic management developments are guided by internal factors of the university. The model also contributes to the practice of strategic direction focused on the innovation ecosystem, which may be adopted by other universities, in this case the State University of Western Paraná, object of this research.

2.2.1 Cooperation between Government, University, and Industry

The cooperation between government, university, and industry has occupied a role of great relevance, if not one of the most important in terms of innovation and contributes to the strengthening and socioeconomic development of countries (Noveli & Segatto, 2012). This cooperation model is discussed by several theories, and one of them is named the Triple Helix (TH), created by Etzkowitz and Leydesdorff (1997). It is defined by the dynamics of innovation

in a way that evolves and generates interactions based on knowledge. In Brazil, TH is known in scientific studies as university-enterprise cooperation (U-E cooperation).

In this model, universities are identified as generators of new technologies, knowledge, entrepreneurship, and research, and therefore attract innovations through technology transfers and incubation of new companies (Etzkowitz, 2013).

TH aims to create an ecosystem of innovation and entrepreneurship, whose objective is to gather diverse actors with leadership roles in the development of projects of common interest that can be reproduced anywhere (Etzkowitz & Leydersdorff, 2017).

Figure 06 shows the social structure of the TH innovation model, and at one point it shows leadership by the government, at another, by the company, and at another, by the university. This leads institutions to interact with each other and form new secondary institutions called "hybrid organizations", aiming to provide development from innovation and entrepreneurship, but also seeking to maintain their primary role and identity (Etzkowitz & Leydersdorff, 2017).

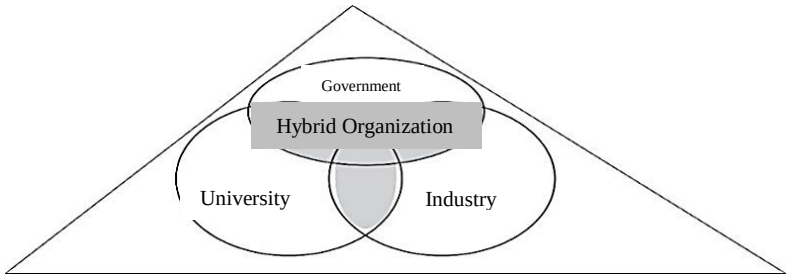

Figure 6. Triple Helix
Etzkowitz and Leydersdorff (2017)

It is identified that the university transmits knowledge and new technologies by describing in a clear and summarized way the representation of the TH performed by each of the actors. The industry is responsible for production and practice, and the government has the role of financing and minimizing the difficulties for the formation of culture, innovation, and socioeconomic development (Etzkowitz, 2009).

In the concept of the Triple Helix, the university starts to occupy a place of positioning and leadership that, until then, was taken up only by industry and government. It no longer is a secondary actor in relation to the others (government and industry) and proves to be capable not only of providing teaching and research, but also of generating new ideas, new businesses, new industries, and large companies (Etzkowitz & Leydersdorff, 2017).

Through external influences, the university is transforming into an "entrepreneurial university" which, in turn, increasingly seeks constant innovations and knowledge in economic

development in order to solve the problems of society at large (Etzkowitz & Leydersdorff, 2017), based on the structure and the various internal and external actors within it. The creation of startups is an example of entrepreneurship (Lemos, 2012).

The role of the entrepreneurial university goes beyond training, since it occupies a primary place in the development of a country through innovation (Ipiranga, Freitas, and Paiva, 2010). It must be in a constant search for new opportunities and improvements in education and research. Besides being able to generate the transfer of knowledge and take various positions in society within the innovation ecosystem (Sam & Van Der Sijde, 2014).

2.3 SIMILAR EXPERIENCES OF STUDIES ON INNOVATION ECOSYSTEM RELATED TO UNIVERSITY, GOVERNMENT, AND INDUSTRY (TRIPLE HELIX)

The following are the studies found in the systematic literature review research on innovation ecosystem related to university, government, and industry (Triple Helix), as described in sections 2.3.1; 2.3.2, and 2.3.3. Studies focusing on aspects related to the roles of universities within the innovation ecosystem and implications for the development of innovations in U-E cooperation and on Innovation Habitats were reviewed.

2.3.1 The roles of universities within the Innovation Ecosystem

When analyzing the university x enterprise (U-E) interaction at the Federal University of Santa Maria [UFSM] and its contribution to the development of companies and research groups, Lopes (2013) identified that the interactions are informal; he verified that there are extra-professional ties in all the companies; he found that only one of the groups serves the companies based on science or "Science Based"; and he evidenced a single group that works with technological development; however, in the academic field, he verified that there is a high scientific technical level; nonetheless, he observed that companies suffer from a lack of research, development, and resources. In his study, the author also identified that the main contribution is related to product and process innovation. The academia is beneficial in teaching, research, and extension; however, he evidenced only one technological research group. Given the analyses, he concluded that the U-E interaction has been positive even with the need for some adjustments.

In a similar study, also at the Federal University of Santa Maria (UFSM), Bandeira (2015) analyzed the characteristics between university-enterprise (U-E) interaction and the contributions of 333 research groups and concluded that of these, only 38 groups have U-E interaction. Bandeira (2015) found that the members of the groups did not provide services and had no links with companies in the incubator of the university analyzed; he evidenced that there are no researchers from private companies; and that there is a greater degree of relevance in the training of researchers in masters and doctorates focused on teaching practice and knowledge transmission within the academy; the development of innovative research focused on companies is seen as of intermediate importance and the qualification is insignificant for companies, and with regard to research, they are considered of little importance in relation to the benefits they can bring.

In a study conducted, Sousa (2018) concluded that universities working together within the ecosystem can bring greater innovative results to society. This study analyzed some Brazilian universities in 21 states that, over the past 20 years, have become promising due to several factors. Entrepreneurship appears as a determining factor for economic development and, to measure it, the Entrepreneurial University Index was developed in order to propose suggestions for improvements in the academic impact.

According to studies conducted by Brazil Júnior, per Martins (2019), the ranking conducted every two years lists the most entrepreneurial universities in Brazil from evaluation criteria such as entrepreneurial culture, innovation, extension, infrastructure, internationalization, and financial capital. The survey aims to understand which practices encourage innovation in higher education institutions. The Ranking of Entrepreneurial Universities (RUE) is a study carried out aimed at evaluating and classifying entrepreneurship in universities. The survey is based on the perception of 15 thousand students from 123 universities in the 27 federative states.

The numbers reveal an exponential growth. The first edition of RUE was held in 2016 and evaluated 42 universities based on the perception of six thousand scholars. The second, in 2017, included the evaluation of ten thousand academics from 55 universities. From the first to the third edition, there was a 292.8% growth in the number of participating universities and a 250% growth in the number of participating scholars. In the sequence, the ranking of the universities according to the evaluated criteria is presented first, and in Table 07, the ranking among the top five universities is shown, and UNIOESTE's position is also highlighted in the same table.

a) GENERAL RANKING: 1st place - University of São Paulo (USP);
b) ENTREPRENEURSHIP CULTURE: 1st place - University of Franca (UNIFRAN);
c) INNOVATION: 1st place - University of São Paulo (USP);
d) EXTENSION: 1st place - University of São Paulo (USP);
e) INTERNATIONALIZATION: 1st place - University of São Paulo (USP);
f) INFRASTRUCTURE: 1st place - University of Franca (UNIFRAN);
g) FINANCIAL CAPITAL: 1st place - University of Pará State (UEPA).

Chart 7. University Rankings

Ranking 2019	Universities	Entrepreneurial Culture	Innovation	Extension	Infra structure	Internationalization	Financial Capital	Grade
1st	University of São Paulo USP	75º	1º	1º	17º	1°	2º	7.36
2nd	State University of Campinas UNICAMP	48º	2º	2º	19º	5º	3º	6.71
3rd	Federal University of Minas Gerais UFMG	77º	6º	4º	13º	6º	12º	5.83
4th	Federal University of Rio Grande do Sul UFRGS	112º	4º	3º	39º	9º	18º	5.47
5th	Federal university of Itajubá UNIFEI	6º	7º	16º	9º	37°	52º	5.41
60th	State University of Western Paraná UNIOESTE	94º	66º	65º	66º	54º	37º	3.85

Source: Brasil Junior (2019).

In the work of Koste (2010), successful strategies between U-E cooperation are exemplified based on the analysis of the educational institutions Pontifical Catholic University of Rio de Janeiro (PUCRJ) and the Dom Cabral Foundation (FDC) and the relationship with Petrobras. Some strategies stand out, such as bringing to academia problems or challenges faced by the company in its routines, in order to develop innovative research that contributes to the

development of the organization; capacity building and training of mentors, researchers, and qualified doctors can meet and approach society.

PUCRJ becomes an entrepreneur due to innovation, since it started scientific research, created the Padre Leonel Franca foundation, and started the U-E cooperation process, making the university a protagonist of the ecosystem. The Dom Cabral Foundation has an Extension Center that is constantly evolving as it has large partner companies, qualified and engaged professors, in addition to presenting a formal and direct relationship with the company in its service steps.

In the study by Koch (2018), conducted in 43 educational institutions in Chapecó - SC, the author found that few institutions are concerned about contributing to the development of an innovation ecosystem, often becoming the protagonists of the actions developed, while others, which could assume the role that is theirs, are not interested, moving only internally. Thus, the ecosystem suffers a lack in its development.

Bizzi (2018) analyzed the U-E interaction in the Technological Institute in Construction Performance (itt-Performance) at Unisinos, where he found that there are several types of interactions. They include consultancies, evaluation of new products under development by the client, technical reports, technological expertise of people, among others. All these interactions are developed through a flow, in order to align and organize the service processes so that there is good customer service.

Lemos (2013) points out that partnerships between universities and companies occur through external stimuli from the government and internally through the university itself. Its format focuses on short-term consulting, and the university transmits its knowledge to the company; however, it is evident that both research groups and companies need to improve their interactions.

The research of Pereira, Marques, de Castro, de Almeida, and Gava (2016) backed up the studies of Lopes (2013) when he identified in his studies that more scientific production is executed than technological innovation.

The work by Ruiz and Martens (2019) understands that universities can become entrepreneurs, capable of generating change in conjunction with government and enterprises, as well as can provide opportunities to the community with the dissemination of knowledge through teaching, research, and extension.

In the study by Noveli and Segato (2012), who reported on the U-E cooperation process for technological innovation in a technological park (TECNOPUC), the authors found that

cooperation is carried out in an informal way, thus facilitating the interaction between those involved. They also analyzed that geographical proximity is a factor that facilitates cooperation.

Gomes, Coelho, and Gonçalo's (2014) state in their study that innovation occurs only through the company and that it is the government's responsibility to mediate U-E cooperation.

According to the studies presented in this category of analysis, it is noted that the U-E interaction is still very little explored, despite being a topic discussed since the 1990s. It can be noted that there are barriers to cooperation between companies and universities, and this may be linked to a cultural issue, since most companies do not see the university as a source of resources that can contribute to the development of their businesses. In relation to university researchers, it is evident that they still maintain priority and efforts in scientific research, with little exploration of technical research with the intention of supplying business needs.

2.3.2 Implications for the development of innovations in U-E cooperation

Lemos (2013) points out in his work that the barriers found in the interaction between universities and companies are related to the issue of their operation, including cultural, operational, and administrative barriers. Bizzi (2018) stresses in his analysis that one of the factors that interferes with the development of innovation in companies is the absence of resources for investments in R&D on their part, and the lack of confidence of companies in seeking solutions with universities.

Ravanello (2017) criticizes the educational system regarding the promotion of entrepreneurship in innovation environments. He suggests the encouragement of academic research with a focus on business and a greater role for the university in these innovation environments to seek local needs and the training of entrepreneurs.

Santos and Peixoto (2019) addressed some obstacles and challenges, in their study, in the consolidation of an Entrepreneurship Ecosystem in the city of Rio de Janeiro. In relation to the challenges, they highlight: Ecosystem with low development; incipient; immature; lack of density and focused concentration in specific areas of the city; absence of articulation; lack of institutional organization; and management problems. And as for the obstacles, the points that stand out the most are as follows: excessive bureaucracy; economic crisis; and legal issues, such as labor, tax, fiscal, and regulatory issues that negatively influence entrepreneurial activity; the city's high costs, including rent, labor, and living costs, urban violence, inefficiency in urban mobility, precariousness in its infrastructure, and difficulties in access to capital.

Achaeffer, Ruffoni and Puffal (2015), in their research, point out that the main difficulties in U-E interaction are the following: bureaucracy on the part of the university, and unfamiliarity on the part of the company with its research objectives.

Noveli and Segato (2012) point out in their work that sometimes divergences can occur between agents about patent ownership, because the expected goals between those involved in the U-E cooperation can be different from what is expected, due to the focus given to property rights. The duration of projects can also be an impacting factor, which generates implications for U-E cooperation. The study points out that long-term projects can generate satisfaction in cooperation for some agents and, for others, it is considered a negative factor. Other factors identified in the Ipiranga study are pointed out by Freitas and Paiva (2010) when they highlight the different languages and cultures and the operational issues in relation to financing and human resources.

In this category, the studies addressed highlighted several factors that interfere with the innovation ecosystem and U-E cooperation, namely: immaturity in ecosystem management; bureaucracy; and again, the issue that the research focus is not business-oriented.

2.3.3 Habitats of Innovation

The Innovation Habitats are differentiated environments with technological characteristics and are conducive to the generation of innovation, in which various actors interact, aggregate, share new knowledge, and contribute to the socioeconomic development of a region or country (Zouain, 2003).

Motke (2017) conducted a multiple case study when investigating companies located in technology parks that are representative in the national scenario and are considered innovation habitats: Santa Maria Tecnoparque, PUCRS Technology Park (TECNOPUC), and UFRJ Technology Park. In his work, he found that companies are concerned with innovation in their products and services, both in the creation of the new and in the improvement of processes. Nevertheless, he observed that, in relation to marketing, the promotion of products and services is weak. These companies have sought to improve their organizational performance; however, innovations are still considered incipient. Another issue is public management, which the author considers weak. He points out that if governance were more participative, it could be favorable to business.

Laimer (2013) identified that companies located in technological parks need to interact with each other to acquire knowledge, information, infrastructure, and services through synergy. They need to seek qualified professionals from other organizations and educational entities, provide an environment of exchange between government, university, and companies, and contribute to cooperation in the development of products and services, aiming at joint gains.

In order to analyze the trajectory of the constitution of the scientific and technological parks consolidated in Rio Grande do Sul in the light of the triple helix in a period of 20 years, Bencke (2016) finds that the participation of the university, the government, the companies, and the leaderships are of paramount importance in the development of innovation. In his work, Bencke made it clear that the models of parks are constituted differently from each other because they have their own characteristics. In his study, the author also highlights the community university, whose role is to develop the interaction between actors and regional development to become the main manager of this innovative environment, while the government has the role of being related to the programs that stimulate regional development for innovation, such as legal, fiscal, and financial resources. As for the companies' role, their performance is proactive in generating demand to the university, but a little shy in the decisions and support to the innovative environments. Finally, the positioning of the leadership in obtaining a vision of the future of technology parks was identified.

In his analysis, Roldan (2016) highlights that the relationship with the use of services and infrastructure offered by technology parks reinforces the favorable conditions for innovation, which come from companies. Nonetheless, the study shows that companies do not usually relate to other companies, as they believe it is detrimental to their business. However, the author shows that the more companies use the resources offered in technology parks, the greater their capacity to innovate.

When investigating the collaboration of the State in the application of competitiveness and innovative capacity in micro and small enterprises inserted in Porto Digital in Recife, Bichara (2013) found that companies innovate from their own efforts and financial resources. And the sharing of their knowledge only occurs when they are in the negotiation phase. The author evaluates that the park is not consolidated as an innovative environment. Consequently, the companies do not have a maturity level focused on innovation, except for startups, considered companies that are closer to innovative models. He also affirms that the state's contribution in relation to the companies' competitiveness is remote and varies from company to company. Moreover, their development occurs individually and not through the park's contribution.

Hoffmann (2019), on the other hand, when analyzing the organizational structures of the companies inserted in the Digital Port, identified in his study that they have indications of low specialization; however, he foresees a model of close relationships, forming partnerships and providing a corporate environment that allows ability and flexibility at work.

Correia and Gomes (2012), in their research on Innovation Habitats in the knowledge economy, state that these environments have the ability to propagate an entrepreneurial and innovative culture, based on available resources. Such environments also contribute to regional development and allow companies to develop and generate added value in their services and products.

Silva, Sá, and Spinosa (2018), in their study related to the Proposal of a governance model for the Brazilian Army, expose that innovation habitats enable economic development, trust, and relationships with universities and companies, capable of generating knowledge within the innovation ecosystem.

Roldan, Hansen, and Lema (2018) conclude that companies inserted in technological parks benefit from the resources available and incorporate innovation into their routine.

The studies reveal that technological parks (innovation habitats) positively contribute to the development and innovation of the players inserted there. Knowledge sharing can also be favorable to the creation of new businesses and generate value addition and regional development. The studies also reveal the importance of the university inserted in these habitats, since it can play a leading role in the interaction with other players. In relation to the government's role, the studies show that its participation is deemed unsatisfactory, since a stronger and more participative role is expected. Nevertheless, the lack of resources and incentives leads companies to develop individually.

Although this topic has been discussed since the 1990s, it is still insipient in terms of scientific research in the field of management and in practice.

According to the studies, it is found that the innovation ecosystem is a dynamic model that generates innovations and regional development that includes numerous benefits to society. The innovation ecosystem also connects players who are concerned with generating interactions and developing the market through technological innovations, business strategies, and entrepreneurship. However, there are barriers and difficulties that limit the development of this ecosystem model and need to be demystified, such as the low confidence of companies in interacting with universities and the fear of businesses to share knowledge with other enterprises. The research inside universities still has, for the most part, a scientific, and not

applied, focus; low government incentive in policies that favor innovative development; bureaucracy, and others.

It is noted that it is not enough to simply create an innovative environment; stakeholders must be engaged in order to propitiate the innovative and shared regional development in which everyone can benefit, as well as society, in order to bring good business results and satisfaction to those who integrate this environment.

3 TECHNICAL PRODUCTION RESEARCH METHOD AND TECHNIQUES

This chapter presents the method used to reach the study's proposed objective of analyzing what has been the role of the State University of Western Paraná in the Innovation Ecosystem of the Western Paraná region, in an entrepreneurial way, in order to provide development in a sustainable manner in the Western region of Paraná.

With the purpose of clarifying and defining the procedures and techniques employed in the study, the research design, data collection procedures, data analysis, and limitations are contextualized.

3.1 RESEARCH DESIGN

The delineations of this study occurred according to the objectives, procedures, and approach to the problem, based on the typologies defined by Andrade (2002). Due to the objectives, it is characterized as a descriptive research. The descriptive research model aims to classify, explain, and interpret the occurrence of facts through observation, analysis, records, and ordering of data without the interference of the researcher (Prodanov & Freitas, 2013). The descriptive research model also presents "[...] a detailed account of a social phenomenon [...]" (Godoy, 2010, p. 124). The research can also be understood as analytical because it analyzes how the facts occur by delving deeper into the subject studied (Collis & Hussey, 2005).

The procedures are characterized by a bibliographic and documental study. A bibliographical research is theoretically grounded because it deals with the object of the study and contributes with elements that can help future analyses of the data obtained. The model is widely used in exploratory and descriptive works (Lima & Mioto, 2007). Nevertheless, documentary research refers to research in which the documents have not yet been analyzed in depth (Silva & Grigolo, 2002).

The approach to the problem is classified as qualitative, since the main concern of this type of study is to understand the phenomena that occur in each case analyzed through the perception of the players involved. The aim is to describe them and not to enumerate or measure them; however, it is worth pointing out that in qualitative studies, the use of some quantitative data is allowed to demonstrate some issue related to what is under study (Godoy, 1995, p. 62). Furthermore, the documentary and bibliographical analyses are descriptive and report the reality studied (Prodanov & Freitas, 2013).

The choice of this approach is justified by the fact that, in qualitative research, the analyses are characterized by being more thorough in relation to the fact being analyzed. In qualitative research, the researcher may be induced to generate understanding based on the data collected (Creswell, 2010, p. 11).

When all questions underlying the study are classified, the data collection and analysis techniques based on the specific study objectives are presented in sequence (Figure 07).

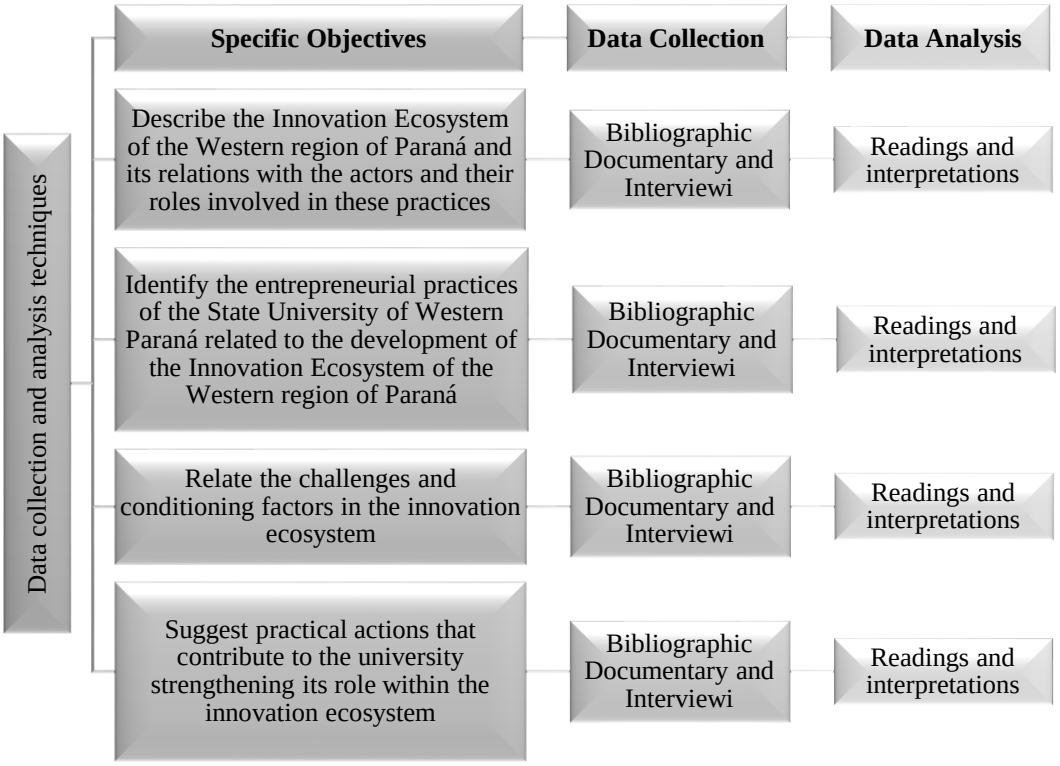

Figure 7. Data collection and analysis techniques

Source: Prepared by the author (2020).

Next, a summary of the research design is presented, containing its nature, approach, objectives, procedures, and study strategy (Figure 08).

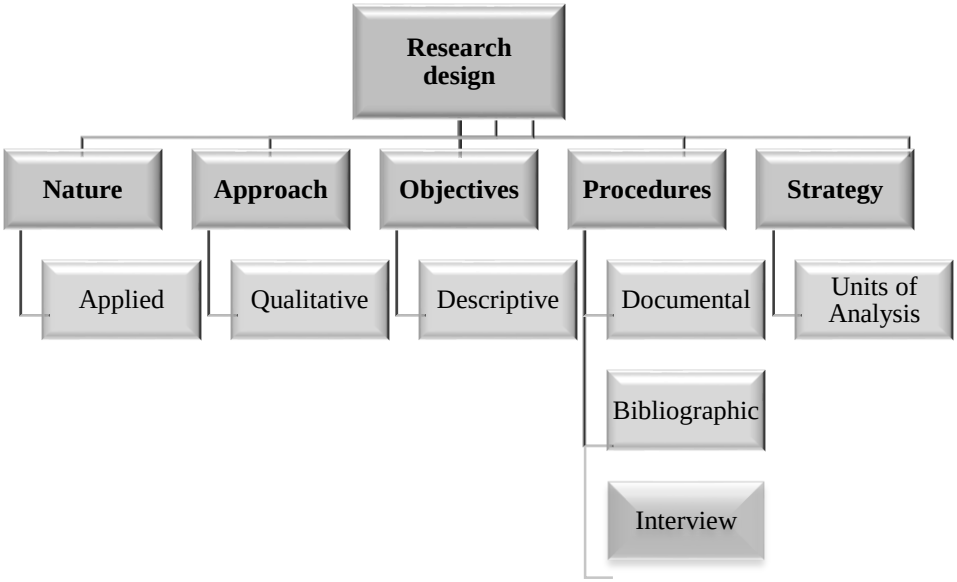

Figure 8. Summary of Research Design
Source: Prepared by the author (2020).

3.2 DATA COLLECTION PROCEDURES

In this chapter, all data collection procedures are presented in detail so that it is possible to achieve the objectives proposed in the work. It is worth mentioning that the data were collected from primary and secondary sources. The first phase of this research counted on a systematic review of the literature related to the theme of this research, and the second on the application of interviews with a semi-structured script with open questions, aimed at the key players involved in the Innovation Ecosystem.

3.2.1 Systematic Review of the Literature

In a previous study, a systematic literature review was carried out in two phases, with the objective of structuring the theoretical part of this research. The first collected national bibliographies and the second selected international bibliographies, as presented in section 2.3 of Chapter 2 of this study.

The study aimed to identify how the Innovation Ecosystem was addressed by the scientific production of articles in the area of administration in Brazil in the period from 2009 to 2019, when the Systematic Literature Review (SLR) methodology was adopted. A Systematic Literature Review translates into the opportunity that the researcher needs to carry out a sequence of broader investigations focused and defined on a certain subject, gathering

facts that are relevant to the intended study (Galvão & Pereira, 2014). The SLR also demands effort and time in searching and ranking papers that are relevant to the study – Kitchenham, Pretorius, Budgen, Brereton, Turner, Niazi, and Linkman (2010).

The search was divided into two phases: the first was the search for theses and dissertations, followed by scientific articles in journals available on the Sucupira Platform and the Scientific Periodicals Electronic Library (SPELL). First, the journals/periodicals whose titles contained the word Innovation were selected.

The search for theses and dissertations was made in the CAPES Theses and Dissertations Catalog and in the Brazilian Digital Library of Theses and Dissertations (BDTD) of the Brazilian Institute for Information in Science and Technology (IBICT).

In the CAPES base, seven search terms were used: innovation ecosystem; ecosystem; "ecosystem" "innovation"; innovation; "innovation" "university"; economic development; and technological parks. Some words were searched in groups using quotation marks and space, and others separately, resulting in a number of 20,136 dissertations and 6,149 theses.

The following inclusion criteria were adopted: academic degree of the document - Master's/PhD; year - 2009 to 2019; major area of knowledge - Applied Social Sciences; areas of knowledge - Administration, Business Administration, and Public Administration; and evaluation areas - Public and Business Administration, Accounting Sciences, and Tourism.

The exclusion criteria were the following: reading of titles, abstracts, and keywords for the selection of thirteen documents: six dissertations and seven theses.

In the BDTD base, two terms were used from advanced search: innovation; and innovation ecosystem, searched separately within asterisks, and choosing "all fields" and "any term", which resulted in 188 dissertations and 52 theses.

The inclusion criteria adopted were as follows: first, the search filters were refined by type of document, dissertations, and then theses. Next, by major area of knowledge Applied Social Sciences, area of knowledge Administration and year from 2009 to 2019.

The exclusion criteria were the same as those used in the CAPES search: reading of titles, abstracts, and keywords, and ten documents were selected.

In reading the abstracts, methodologies, and conclusions, we decided to prioritize the studies that approached the theme Innovation Ecosystem, which was related to the university, government, and industry (Triple Helix). Thus, at the end and considering the two bases, twenty-three studies (theses and dissertations) that met the established criteria were chosen.

The search for articles was the second phase of the search and, initially, the journals to be used were defined. First, the criteria for choosing the journals to be studied were as follows:

national journals that were classified under the Qualis classification system A1, A2, B1, B2, B3, B4, and B5 in the "Public and Business Administration, Accounting, and Tourism" evaluation areas of the Coordination for the Improvement of Higher Education Personnel (CAPES); and including the word "innovation" in their names/titles. After the search for national journals, international journals were searched framed in the Qualis ranking system from A1 to B3 using the same search criteria, containing the word "Innovation" in their name.

A report was generated in the Sucupira Platform for the search of all journals by Qualis defined according to the specified evaluation area, within the journal classifications of the 2013-2016 quadrennium, generating a total of twenty national journals and eighteen international periodicals. Therefore, sixteen national and six international journals were selected.

The national journals selected were: RAI - Revista de Administração e Inovação, and Comunicação & Inovação (B1); Revista Brasileira de Gestão e Inovação, Revista Brasileira de Inovação, Revista de Administração, Sociedade e Inovação, Ideias e Inovação lato Sensu, Revista Inovação, Projetos e Tecnologias (B3); P2P & Inovação, Revista de Empreendedorismo, Inovação e Tecnologia, Revista de Inovação Tecnológica, Revista Eletrônica Científica Inovação e Tecnologia, Revista em Gestão, Inovação e Sustentabilidade, Revista Geintec: Gestão, Inovação e Tecnologias, Revista Latino-Americana de Inovação e Engenharia de Produção (B4); Revista de Empreendedorismo, Negócios e Inovação (RENI), and Revista de Empreendedorismo e Inovação Sustentáveis (B5).

The international journals selected were: European Journal of Innovation Management (A1); Innovation: Management Policy & Practice International, Journal of Innovation and Sustainable Development, Journal of Technology Management & Innovation (A2); International Journal of Innovation, Technology Innovation Management Review (B3).

The exclusion criterion used for the other journals was the fact that they contained other terms in their names that differed from the objective of the term addressed in this research. Thus, journals that presented in their names, terms such as: innovation in the health area, tourism, among others that were not considered congruent to the objective of this study were excluded.

In the national journals, the following search terms were used: innovation ecosystem; innovation; innovation at university; ecosystem; university and triple helix.

The same criteria of the national journals were used for the search of the international journals along with the following terms: *ecossistema*; *inovação*; triple helix; ecosystem; ecosystem of innovation; ecosystem of innovation university; and innovation, and the result obtained was the visualization of 96,234 articles, from which only ten articles were selected.

The largest number of articles related to the research theme was found in the journal Innovation: Management, Policy & Practice; however, the articles were not freely accessible for research. Searches were also conducted in the Scientific Periodicals Electronic Library (Spell) with the following terms: ecosystem; innovation; triple helix; university innovation; and innovation ecosystem; and the result obtained was the visualization of 2,784 articles. Regarding exclusion and inclusion, the same criteria adopted in the search for dissertations and theses were used, resulting in twenty-eight selected articles.

The papers raised in the searches were analyzed quantitatively and qualitatively and were classified into categories for analysis and discussion: the role of universities within the innovation ecosystem; implications for the development of innovations in the cooperation between U-E and Innovation habitats.

The studies of the categories reported in 2.3.1 "**The role of universities within the innovation ecosystem**" focus on how the university acts within the innovation ecosystem and the perception of companies. Category 2.3.2 "**Implications for the development of innovations in U-E cooperation**" concentrates the studies on factors that impact on U-E cooperation. And the category 2.3.3 called "**Innovation Habitats**" demonstrates positive and negative points observed among the actors of the innovation ecosystem.

3.2.2 Interviews

The primary data that refer to the direct search at the source were collected through semi-structured interviews (Cooper & Schindler, 2011). The questions were designed to facilitate the identification of U-E cooperation practices in an entrepreneurial manner, which contribute to the development of the Innovation Ecosystem. The semi-structured script used in the research is in the appendices of this work (Appendix 1).

The questions for data collection in this research were adapted according to the research script in Bittencourt's PhD Thesis (2019), with regard to questions related to the innovation ecosystem and U-E cooperation.

Data collection began in December 2020. Regarding the people invited to participate in the interviews, they are key actors in the development process of the Innovation Ecosystem of the Western region of Paraná and are involved with innovative and entrepreneurial practices. People who perform or have carried out actions, such as cooperation between U-E,

entrepreneurial projects, agreements with companies, development of Startups, among others, were interviewed.

Thus, the semi-structured script of the research interviews that contemplated the analysis categories and the proposed objectives, where participants could express their opinion, was presented. A type of script was proposed for all those involved in Cascavel's Innovation Ecosystem, the cooperation between U-E and companies. Initially, the Nucleus for Advanced Research in Administration, Accounting Sciences, and Economic Sciences (NUPEACE), the Technological Innovation Center (TIC), and the Deanship of Administration and Finance (PRAF), belonging to the university, were contacted. Next, with the information in hand, one of the companies that has already carried out cooperation processes with the university, UNIMED, was contacted, as well as Iguassu Valley, which is a sectorial center of the Commercial and Industrial Association of Cascavel and a member of the Regional Innovation System of the West in Development Program (SRI). It was also possible to interview one of the SEBRAE representatives from the city of Toledo-PR, in addition to the SRI representative.

It is noteworthy that the university is part of the triple helix in building the Cascavel Innovation Ecosystem through NUPEACE and TIC. This alliance strengthens regional development through the dissemination of the culture of innovation and entrepreneurship, besides contributing to the formation of new businesses, jobs, work, and income, providing technical support to teams from the so-called *Hackathons* (startups in the early stages of idea development), thus becoming a link between university and enterprises.

NUPEACE also has an innovation HUB, where startups have the possibility to develop new ideas (often related to technology). Its main objective is to help these entrepreneurs to work, meet, and exchange with business investors and even other startups. Its process takes place by public call and after selection, pre-incubation begins. The team counts on the infrastructure and advisory services of professors and professional partners who are knowledgeable, part of the academic community and private companies.

Initially, the script identified the profile of the respondents. Next, thirteen questions addressed the internal and external practices related to the ecosystem, and to conclude, five questions dealt with the challenges and conditioning factors.

The interview questions were formulated according to the theoretical framework along with the proposed objectives and by categories, as can be seen in Figure 09.

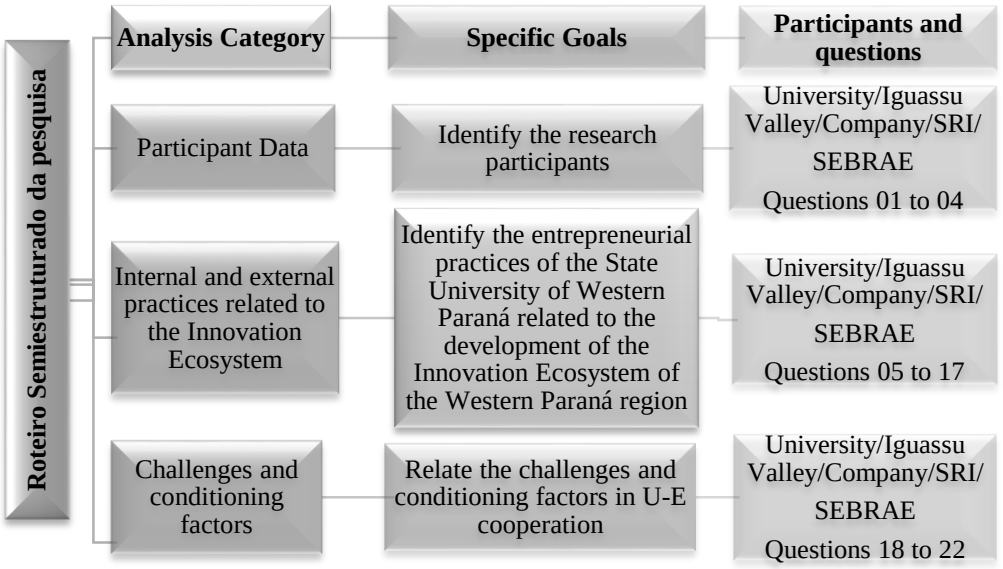

Figure 9. Semi-structured Survey Script

Source: elaborated by the author (2020).

The next step was to invite and explain the research proposal to the participant via WhatsApp messages.

The interviews were face-to-face according to the availability of day and time of each participant at their headquarters, respecting the schedule. Some could not take place in person; therefore, the option was to use online resources via conferencing through applications (App). The interviews were recorded for later description and analysis of the data obtained.

In addition to the interviews, a documentary research was also conducted based on other sources of secondary information, such as articles, public calls, notices, reports, news, among other materials that enabled the identification of information that contributed to the understanding of the subject in question. They also allowed validating the information obtained in the interviews and contributing to a better understanding of the phenomenon under study (Yin, 2015).

3.3 PROCEDURES AND DATA ANALYSIS

In this subchapter, all forms of procedure for analyzing and processing the data collected have been pointed out in detail in the research.

With the information collected through transcribed interviews, annotated observations, searches in secondary sources and the theoretical framework, we moved on to the next phase of this study, in which Content Analysis was considered the most appropriate procedure for this research. The most suitable choice depends a lot on what will be analyzed and the proposed objectives of the study (Chizzotti, 2006). Content Analysis comprises a set of analysis techniques through systemic procedures that infer content knowledge in communication and texts, and it can be quantitative or qualitative (Bardin, 2011). This technique interprets and gives meaning to the data under analysis (Flick, 2009). One of these procedures is the most used in Brazilian qualitative research in the area of administration (Dellagnelo & Silva, 2005), because it allows identifying what is being said about the subject in question (Vergara, 2005).

Content analysis "is one of the classic procedures to analyze textual material, regardless of its origin" (Flick, 2009, p. 291). These procedures can be of several types: field diary, transcription, photos, audios, filming, among others that facilitate and enable the analysis (Flick, 2009).

The analysis process involves several steps that include three phases: 1st - Pre-analysis; 2nd - exploration of the material; and 3rd - treatment of results, inference, and interpretation (Bardin, 2011) (Figure 10).

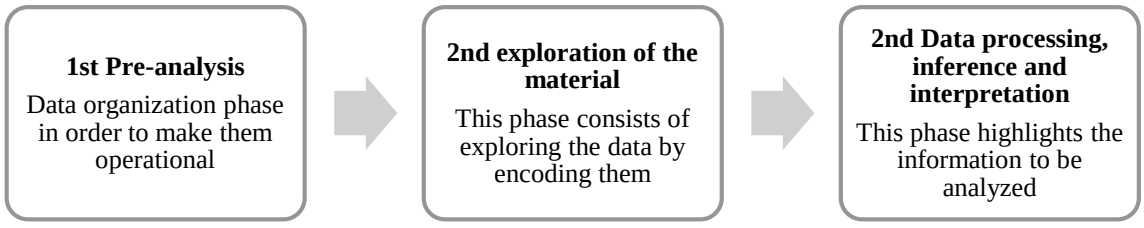

Figure 10. Phases of Content Analysis

Source: Prepared by the author (2020).

Therefore, the procedures and data analysis of this study occurred from the model presented in Figure 10. Pre-analysis is the phase in which the data collected are organized in the research and systematized for the following phase through the reading of the text. A choice is made on what will be analyzed in the various documents, objectives and hypotheses are formulated, and indicators are developed. In the second phase, which is material exploration, is

the time when the material will be classified, categorized, and coded to describe it analytically based on the theoretical framework. Finally, in the third and last phase, but no less important, is the moment when the treatment of the results and the reflective interpretation and criticism of the study will be carried out (Bardin, 2011).

Initially, the transcription of the interviews was made so that the reading of the key positions could be subsequently carried out. Next, the classification and categorization of the content was performed as from the crossing of the key posts to compare what the participants answered according to each analysis category. Finally, the analysis and conclusions of the results were performed, as shown in Figure 11.

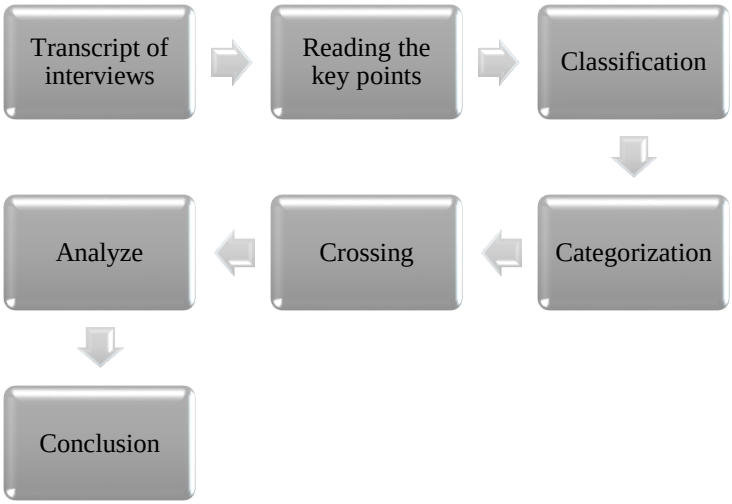

Figure 11. Flow of analysis and conclusion of the interviews

Source: Prepared by the author (2020).

3.4 LIMITATIONS OF RESEARCH METHODS AND TECHNIQUES

There were limitations in the collection of information that did not contribute to the theoretical framework since the proper reading of some international studies was not authorized. There were also difficulties in interviewing some actors involved in the innovation ecosystem process in the region, due to the incompatibility of agendas and their lack of interest. We insisted on interviewing them, given the importance of the overview of the interaction of the players in the innovation ecosystem in the western region of Paraná as to the results of this research; however, even after several attempts to schedule possible interviews and explain the importance of everyone's participation, it was not possible to interview them.

4 ANALYSIS AND INTERPRETATION OF RESULTS

This chapter presents the analysis and interpretation of the results obtained in this study according to its objective.

4.1 THE INNOVATION ECOSYSTEM OF WESTERN PARANÁ

The innovation ecosystem in Western Paraná has a program to support economic development and territory development in the western part of the state, called "West in Development". It is a Regional Governance action that aims to promote the economic development of the region through a participatory process in order to encourage cooperation between public and private actors for the planning and implementation of an integrated development strategy (Programa Oeste em Desenvolvimento [POD], 2020).

The Program aims to institute strategies for the development of 54 municipalities and 1,400,000 inhabitants that comprise this mesoregion of Paraná. It acts on the territorial, technological, and innovative base structures, identified by data survey on the socioeconomic and demographic-enterprise profile of the region. The function is to make the environment favorable for the creation and evolution of business, in a sustainable way, through the access to new technologies and innovation. In addition, it organizes the territories in a way that meets the needs of the municipalities that are part of the micro-region, considering local characteristics and strengthening socioeconomic growth (Pod, 2020).

Its structure was outlined in a way that contemplates the implementation needs, performance strategies, and service objectives in the region, and for this purpose, it is contemplated by the following pillars:

a) Action Levels: the territorial planning has a regional scope, where actions take place in all the municipalities of the Developing West territory;
b) Structuring Axes: it is necessary to create axes that can support the competitiveness of the Propulsive Productive Chains;
c) Activity focus: the production of the West is diversified and has several activities that develop it, including the production of grain, livestock, pharmaceuticals, tourism, transport material, logistics, wood-pulp, and furniture. Some of these productions stand out: 63.5% in swine herd; 31.9% in chicken herd; 22.5% in milk

production; 73% in tilapia production; 35% in corn production; 21.3% in soy production; and 12.8% in wheat production (Pod, 2018);

d) System of Regional Indicators: this is a knowledge and mobilization tool whose objective is information management. It provides support for diagnoses, mapping, and territory planning, and will also provide information to municipalities for the development of their actions;
e) Governance: the management structure divided into different spheres, designed to ensure maximum participation and representation of society and its interests to reinvigorate the proposal of an integrated development network.

Below, some figures of the Western Paraná that are worth highlighting through their indicators will be presented. These numbers contribute to its understanding in a clear and objective way, according to the POD (2018):

As for the indicator that evaluates the population estimate, the West region represents 11.56% in relation to Paraná State, with 1,309,564 inhabitants. Paraná has 11,320,892 inhabitants, the South region has 29,644,948 inhabitants, and Brazil has 207,660,929 inhabitants, according to the data obtained in the last survey in 2017. Regarding the urban and rural population, according to a survey conducted in 2010, the West represents 11.71% of people in the urban environment in relation to Paraná, and 11.45% of people in the rural area.

In terms of the Municipal Human Development Index (MHDI), also conducted in 2010, the municipalities of Quatro Pontes in first place with 0.791, Cascavel in second place with 0.782, Marechal Cândido Rondon in third place with 0.774, Palotina in fourth place with 0.768, and Toledo in fifth place with 0.768 stand out.

Western Paraná has become a region of extreme importance for Paraná's agribusiness, gaining prominence due to cooperativism, besides leveraging the most diverse production chains, especially the swine, poultry, eggs, milk, fish, and agricultural chains. Regarding cooperativism in Paraná, a survey was conducted between 2015 and 2016 in which 220 cooperatives in the state were evaluated to identify their representativeness. The turnover was R$60.3 billion in 2015, or 16% of the Gross Domestic Product (GDP) of Paraná. Of these evaluated cooperatives, 74% belong to the agribusiness, therefore, 57.8% of the agricultural and livestock economy of Paraná, which, in 2016, had a turnover of R$ 45 billion, which represents 75% of the total cooperative turnover.

In the ranking among the cooperatives with the highest revenues in 2016, seven of the fifteen largest are located in Western Paraná. Coamo is in first place; C. Vale is in second; Lar

is in third; Cocamar is in fourth; Copacol is in fifth; Castrolanda is in sixth; Agrária is in seventh; Integrada is in eighth; Frimesa is in ninth; Frísia is in tenth; Coopavel is in eleventh; Coasul is in twelfth; Copagril is in thirteenth; Capal is in fourteenth; and Primato is in fifteenth place in the ranking (Pod, 2018).

The Investment of the cooperatives in the West in 2016 was R$772 million; together they have a total of 47,624 thousand members; 89% of agricultural establishments are associated with a cooperative; and almost 82% of these establishments belong to family farming.

According to Figure 12, the prominent jobs in the Western Paraná region are in Cascavel, with four activities among the ten-best rated, as can be seen below (Pod, 2018).

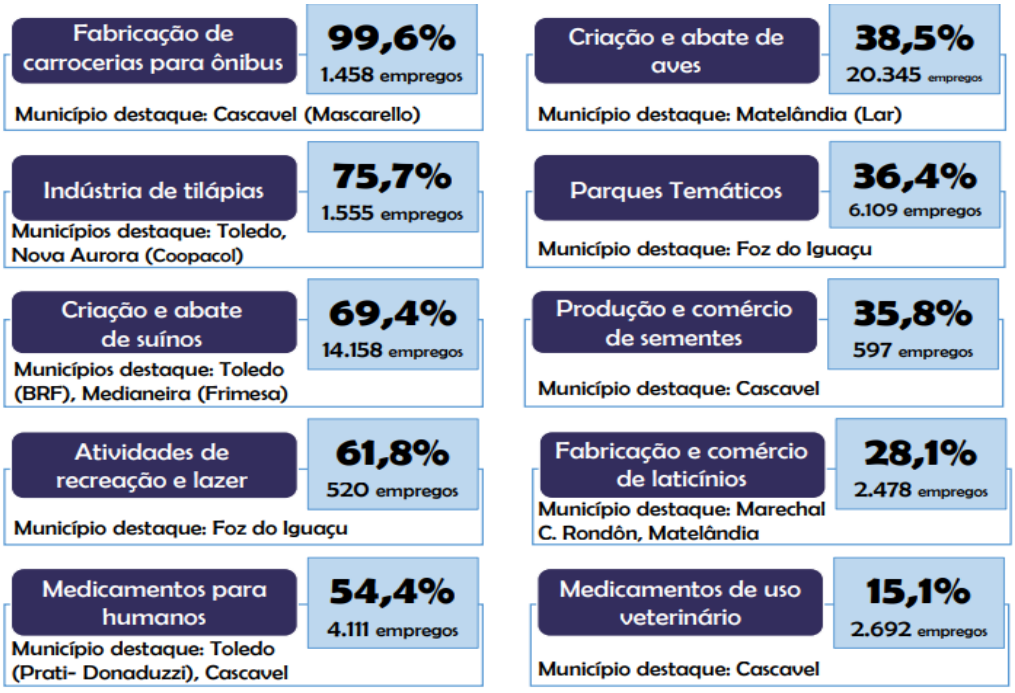

Figure 12. Activities that most employ in the Western region of Paraná - 2016

Source: West in Development (2018).

Still on jobs, Paraná is the largest in poultry slaughtering jobs in Brazil (31%); it is the third largest in bus body manufacturing jobs (11.4%); and the third largest in pork slaughtering jobs (18.5%). The sectors that employ the most in the western region of Paraná are Public Administration (12%); pig and poultry slaughtering, among other small animals (8%); retailing of goods in general, with a predominance of food products - super and hypermarkets (3.8%); road freight transport (3.1%); and restaurants and other food and beverage service establishments (2.7%). The West of Paraná is also a reference in exports of its products to the

most diverse countries, with U$ 1.4 billion, representing 9% of Paraná's exports, 4% of the South region, and 1% of the Brazilian exports. Education in the region is also a reference.

Within the West in Development Program, the Technical Chambers, which are groups formed by representatives of institutions and municipal and regional companies, whose co-responsibilities are the identification, the exploitation of opportunities, the confrontation of bottlenecks, and the planning of the Productive Chain and Structuring Axis Plans, are constituted. Among all the chambers, the Technical Chamber named Regional Innovation System (POD, 2020) stands out for this study.

The Regional Innovation System (RIS) of Western Paraná is a network with various actors (government, university, and company) that interact with each other in order to provide a favorable environment for innovation for regional development with the aim of enabling the generation and use of innovation and technologies (Sistema Regional De Inovação, 2020).

The RIS acts in order to stimulate, connect, and monitor the implementation of projects, actions, businesses, public policies, and other initiatives that can strengthen the Innovation Ecosystem, in accordance with the strategies of the West in Development Program. Its focus is to become, by 2030, a world reference in the development of technologies and innovation through the integration of regional competencies (SRI, 2020). In Figure 13, it is possible to visualize its performance structure that contemplates the main pillars for its development through cooperation, resources, public policies, education, and innovative entrepreneurship.

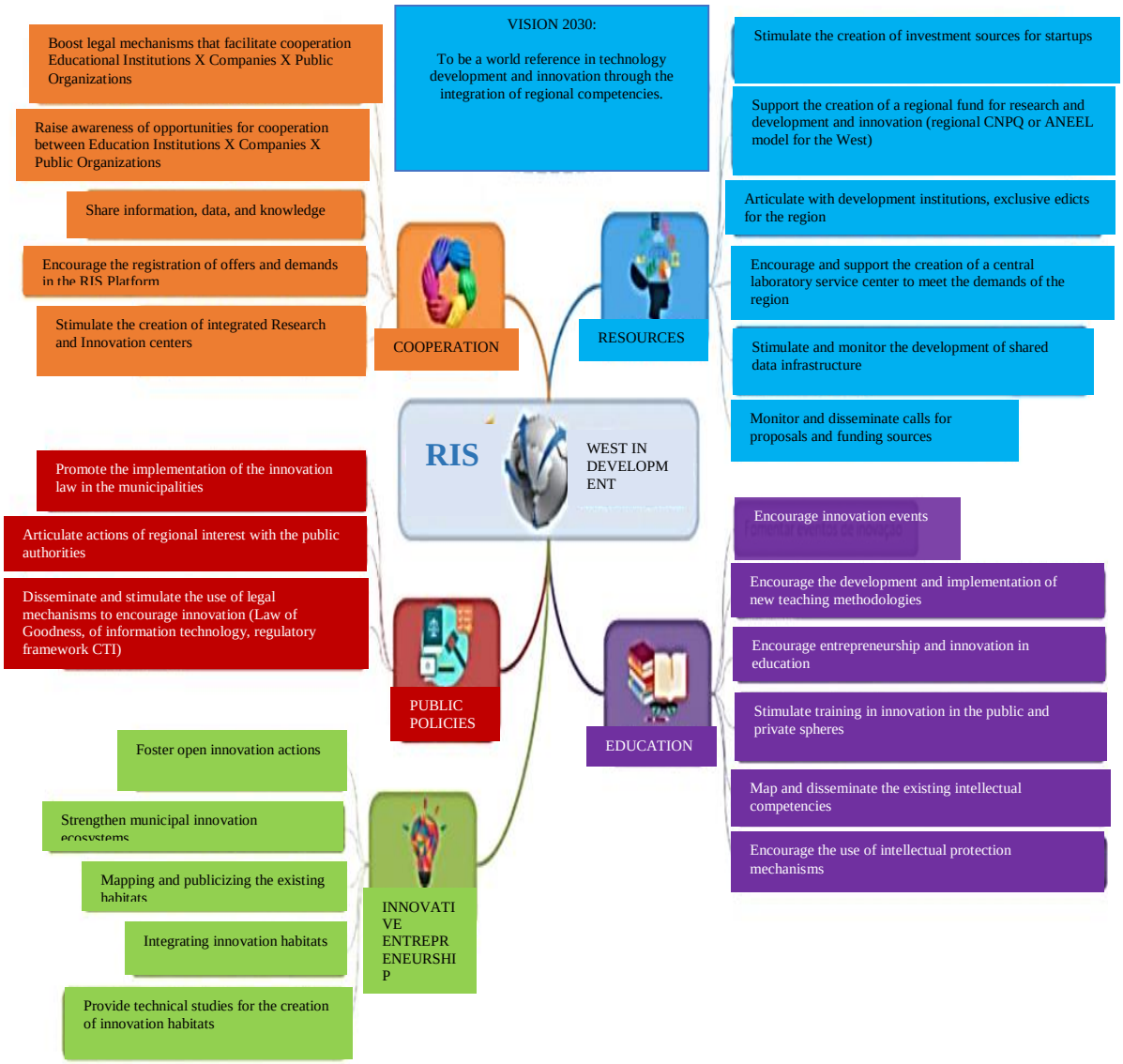

Figure 13. Regional Innovation System

Source: RIS (2020).

In Cascavel, the actions of the Regional Innovation System are led by the Innovation Nucleus Iguassu Valley, which aims to develop the regional Innovation Ecosystem together with the players involved (government, university, and industry), through weekly meetings that take place in the Trade Associations of each city that is part of this nucleus: Cascavel, Toledo, Foz do Iguaçu, Marechal Cândido Rondon, and Palotina. (Iguassu Valley, 2020).

Several actions occur for the development of innovation in the region, including lectures focused on innovation and entrepreneurship, the Startups meeting, national and international Hackathons, meetings on strategic planning, the connection with the state government for the launch of innovation programs, national and international symposiums, among many other actions (Iguassu Valley, 2020).

Given the vast scenario of growth that the Western region of Paraná has shown in its development over the past few years, it is evident the potential for socioeconomic growth in this region. Therefore, it is of utmost importance that the university plays an innovative and entrepreneurial role through various actions and contributes to the strengthening and development of the region's Innovation Ecosystem.

4.2 UNIOESTE

UNIOESTE, the main actor in this study, is classified as a public, regional and multicampus institution, composed of five campuses located in the cities of Cascavel, Foz do Iguaçu, Francisco Beltrão, Marechal Cândido Rondon, and Toledo, and it is a reference in the field (Unioeste, 2020).

The university is formed by the union of the faculties of Cascavel (Fecivel, 1972), Foz do Iguaçu (Facisa, 1979), Marechal Candido Rondon (Facimar, 1980), and Toledo (Facitol, 1980), and in 1999, the campus of Francisco Beltrão was established. In 1994 it was recognized as a university, which encompasses a total of 94 cities, of which 52 cities are in the West region and 42 cities in the Southwest region of Paraná. In 2000, the University Hospital of Western Paraná (HUOP), formerly Cascavel Regional Hospital, integrated with the university. Its goal was also to integrate academics from medicine, nursing, pharmacy, physiotherapy, and dentistry courses into practice (Unioeste, 2020). In Figure 14, it is possible to visualize the region where UNIOESTE operates in the state of Paraná.

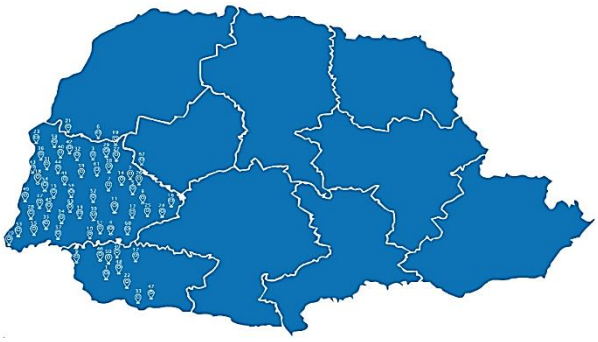

Figure 14. Region of operation of UNIOESTE in the state of Paraná

Source: UNIOESTE (2020).

The mission of the university' is to "produce, systematize, socialize knowledge, and contribute to human, scientific, technological, and regional development, committing to justice,

democracy, citizenship, and social responsibility" (Unioeste, 2020, p. 1), committed to the dissemination of knowledge and training of professionals.

UNIOESTE has 64 undergraduate programs with 11,387 academics; 32 Lato Sensu postgraduate programs with 509 academics; 36 master's programs with 1,057 academics; 14 doctoral programs with 582 academics; 1800 direct and indirect collaborators; and a total of 1,268 faculty members (Unioeste, 2020).

It is ranked in several rankings, with prominent positions among the best Brazilian universities related to innovation, sustainability, technology transfer, and knowledge, among several other highlights and awards.

Awards won by the university: first place in the 23rd Science and Technology (S&T) Award of Paraná in 2009; it was among the 10,252 proposals from 599 Brazilian universities in the Santander Science and Innovation (S&I) Award in 2012; 1st place in the FINEP Innovation Award 2012 - South Region; it was among the three finalists in the national phase (Nit, 2019).

UNIOESTE ranks 62nd among 197 universities in Brazil, evaluated in the Folha University Ranking (RUF) (2019). In this ranking five indicators, whose data are collected on national and international bases, are evaluated. And among the sixteen evaluated universities of Paraná, UNIOESTE ranks 7th.

The innovation and research indicators stand out. In the innovation indicator, UNIOESTE ranks 32nd among the 197 Brazilian universities. Regarding the universities of Paraná, it ranks 5th, behind only the Federal University of Paraná (UFPR), the Pontifical Catholic University of Paraná (PUCPR), the State University of the Midwest (UNICENTRO), and the Federal Technological University of Paraná (UTFPR). And in the research indicator, UNIOESTE is in 61st place out of 197 Brazilian universities, and among Paraná's universities, it has the 6th highest score.

Another ranking in which universities are evaluated is the impact related to the Sustainable Development Goals, according to the University Impact Rankings (2019) by the Times Higher Education (THE). In this study, 450 universities in 76 countries were evaluated, and UNIOESTE ranks in the 300+ position. When compared to Brazilian universities, UNIOESTE ranks 15th and is among the four best evaluated Paraná universities in the ranking.

There is a study conducted by THE's World University Rankings (2019) that evaluates thirteen indicators in approximately 1,400 universities in 92 countries. UNIOESTE is among the forty-six Brazilian universities evaluated, and among seven in Paraná. On the evaluated indicators, UNIOESTE stands out among Brazilian universities in research and industry income

that is characterized by its technology transfers and knowledge dissemination. It is in the 23rd position, and among the highest scores, it occupies the 34th position. In relation to the position of universities in Paraná, it ranks third, and in relation to the highest score, it ranks fourth.

Regarding the quality of higher education institutions in Brazil, with grades between 4 and 5, considered excellent, UNIOESTE has grade 4 along with only fifteen other Brazilian universities that have the same grade. And in relation to the universities of Paraná, it stands among only six universities, according to the General Index of Courses (IGC) (2018), published by the National Institute of Educational Studies and Research Anísio Teixeira (INEP) of the Ministry of Education (MEC).

4.3 PERCEPTION OF THE MAIN ACTORS ON THE ROLE PLAYED BY THE STATE UNIVERSITY OF WESTERN PARANÁ WITHIN THE INNOVATION ECOSYSTEM OF THE WESTERN REGION OF PARANÁ

This section presents the results of the interviews conducted with some of the main players about the role played by the State University of Western Paraná within the innovation ecosystem of the Western Paraná region, which can solve problems and meet the social needs of the region, the purpose of this study, whose focus is the city of Cascavel. The interviews occurred with the following: Nucleus for Advanced Research in Administration, Accounting Sciences and Economic Sciences (NUPEACE); Innovation and Technology Center (TIC); Dean of Administration and Finance (PRAF) of UNIOESTE; National Confederation of Medical Cooperatives of Cascavel (UNIMED); Iguassu Valley Movement; Regional Innovation System (RIS) of Western Paraná and, Brazilian Service of Support to Micro and Small Enterprises (SEBRAE).

4.3.1 Nucleus for Advanced Research in Administration, Accounting, and Economic Sciences (NUPEACE)

Initially, we sought to identify the names of the agents involved, participants, position or function, and the areas involved in the cooperation. The first person to be interviewed was Professor Maria da Piedade Araújo, from the Economics course, and coordinator of the Nucleus for Advanced Research in Administration, Accounting and Economic Sciences (NUPEACE), where the UNIHUB is allocated, an innovation Hub that is a partnership between UNIOESTE, SEBRAE, UNIMED, and the Innovative Business Plant (UNI).

About the internal and external practices related to the ecosystem, Professor Maria da Piedade said that, when she took over the coordination of NUPEACE in 2016, she sought partnerships with the Foundation for Scientific and Technological Development (FUNDETEC) and SEBRAE, in order to engage the core in the development of entrepreneurship at the university. The goal was to play a role in the entrepreneur's journey within the innovation ecosystem in the pre-incubation phase. There were three calls, with some teams pre-incubated; however, the result was not as expected, but they managed to qualify some entrepreneurs and helped FUNDETEC in the development of business plans of entrepreneurs who participated in their calls, for the incubation phase.

The Professor commented that the effective involvement of the university within the ecosystem was in early 2017, when NUPEACE became part of Iguassu Valley and RIS, with support from the main partner of the ecosystem, SEBRAE. He also cited the beginning of the first university/company partnership held by NUPEACE with UNIMED in 2019, through a public call, whose main objective was the construction of an innovation HUB on the UNIOESTE premises. At this point, the partner made available a space with the minimum infrastructure necessary to create an innovative environment to serve the teams from its hackathons. To formalize it, a technical and scientific cooperation agreement was signed, valid for five years, which can be extended for another five years.

According to the Professor, the first team started in 2020 and has already gone through several boards with the help of SEBRAE and UNIMED and is currently in the final phase. After the closing of the activities, it will be possible to verify the purchase of the solution by UNIMED. The professor hopes that with the realization of entrepreneurial marathons, she can obtain a greater densification of startups in the innovation hub. The first edition of the entrepreneurial marathon at UNIOESTE started in 2020 and was contemplated with a Public Call from the Araucária Foundation to support entrepreneurship. As for the main milestones of the process in the region, the Professor believes that the Iguassu Valley movement is of utmost importance.

It was asked how the decisions and the structuring of the innovation ecosystem in the region were made, and also about the participants in the process. The interviewee answered that UNIOESTE, Cascavel Campus, did not participate in the beginning of the process, but professors from the Toledo Campus were invited to participate in RIS. She commented that the only active member from Toledo is Professor Gustavo from the Applied Social Sciences area and coordinator of one of the Public Policies working groups. The professor commented that there is no active participation of professors from Foz do Iguaçu. She also mentioned the names

of some professors and agents that do participate in the movement: her own participation, that of Professor Reginaldo, Professor Jerry, and Selmo from TIC, all from the Cascavel Campus.

About the involvement among the participants in this innovation ecosystem, the professor stresses that all are volunteers. There is no formal representation by the university and there is no demand from the regional system to ask for representatives to the university.

When asked about the role of UNIOESTE and its characteristics, the Professor commented that in the system, the role of the university is crucial as well as in other higher education institutions because any innovation ecosystem that has been successful has occurred due to the engagement of entrepreneurs with educational institutions in the public sector. She also said that the university is a generator of intellectual capital, trainer of people with the capacity to develop innovative ideas and to absorb the available technology more easily. She pointed out that, although the university has a somewhat insipient role, it is possible to observe that there is a greater involvement as one of the links of the triple helix, which makes innovation really happen and go to the companies. He cited as an example an edict from the National Council for Scientific and Technological Development (CNPQ), which selected master's and doctorate degrees in partnership with companies. The master's and doctoral students will be able to develop dissertations and thesis aimed at solving real problems in a company. In this way, we can see that the university is starting to develop its role within the ecosystem.

Regarding the main elements in the university practices that impact the innovation ecosystem, the Professor said that they do not exist yet at UNIOESTE; however, they are in the process of implementing an institutional policy of innovation and entrepreneurship based on the federal innovation law, because the state law is in progress due to the need for the university to have this institutional policy that effectively enables its participation in the ecosystem.

The professor also stated that the university has a Technological Innovation Center (TIC); however, this center is not recognized in all campuses of the university, nor the importance of using the innovation law or the issue that the university has a fundamental role within a TIC. Therefore, the standardization of a regulation would be the first legal milestone. She commented that the state government is taking the initiative to make the TICs of the state of Paraná and the HEIs follow the same relationship pattern with companies.

As for the efforts that UNIOESTE has made or is making to help create the innovation ecosystem, the Professor stressed that the university has been seeking several partnerships, and she as the representative of the innovation HUB, always seeks to be in contact with the entrepreneurs of the region, and they become mentors in the innovation processes.

When asked about how and when UNIOESTE planned and structured itself to act in the innovation ecosystem, the interviewee said that things have been happening voluntarily with the participation of some people; however, she believes that UNIOESTE's mark within this ecosystem will be when it has an institutional policy, and then it will be possible to say that it is entering the process in a formal way.

About the university's partnerships with companies, Maria da Piedade said that each one involved does it in his or her own way, regardless of the Campus, because there is no standardization for this. She said she understands that this is a role to be played by the TIC and that they are trying to regularize it; however, there is still no clear policy.

Another question asked was how UNIOESTE finances and monetizes its research and commercialization practices and the Professor answered that the practices are carried out by the TIC. Regarding the way UNIOESTE influences the development of new ventures in startups, Maria da Piedade said that it has fostered the partnership with UNIMED in the innovation HUB. She thinks that in the medium term she will be able to obtain more partnerships with other companies and the creation of new startups that will allow them to generate solutions for these companies.

It was questioned why the university decided to set up an innovation HUB and the respondent said that it was not an initiative of the university as an institution, but of NUPEACE, which already had a partnership with FUNDETEC and SEBRAE, and of the need to create this innovation HUB.

Maria da Piedade also commented that regarding the ways UNIOESTE stimulates entrepreneurship in the community, both in the internal and external public, it is still very incipient, and also stated that it is not possible to say that the university has a policy to encourage entrepreneurship. However, she observes that some undergraduate courses have included entrepreneurship and innovation in their curriculum, such as Business Administration, Economics, Computer Science, Pharmacy, and Civil and Agricultural Engineering, but there is not an institutional policy.

Still about the ways of encouraging entrepreneurship, Maria da Piedade cited examples of actions carried out by NUPEACE, such as the partnership signed with Araucária Foundation to hold the entrepreneurial marathon. It was the first time this happened at the university. She also talked about the partnership with SEBRAE in the Startup-Garage program, whose objective is to sensitize the academics about the importance of entrepreneurial spirits. She commented that this is already the third year that the Assis Gurgacz Foundation (FAG) participates in this program and UNIOESTE is in its first edition.

When asked about UNIOESTE's management structure, whether it is flexible and easily accessible for being able to minimize bureaucracy in order to facilitate the interaction between the actors of an innovation ecosystem, the participant's answer was that this management function should be a responsibility of the TIC; however, it does not exist yet.

Regarding the challenges and conditioning factors to be overcome by UNIOESTE in the development of this ecosystem, the Professor said she is not sure if it is possible to say that the university is facing challenges, because there is not yet an involvement that can be called institutional. This occurs when the university has instruments and sends its representatives in a formal way and they speak on behalf of the university, bringing and giving feedbacks to the management of the institution.

The participant was asked if there were critical factors and or barriers for the practices to be successful in the university/company cooperation process. The answer was that there were no obstacles in relation to the partnership with UNIMED. The professor also complemented that all the needs for the opening of the public call notice were met by the Cascavel Campus with its legal support. And in relation to the facilitating factors for the university/company cooperation process, they also existed in an easy and prompt manner.

For more information on this study, the interviewee cited some actors involved in the ecosystem that she considers important, such as Jadson Siqueira and Ronan Medina from the Iguaçu Valley movement, Alan Debus from SEBRAE, and Nilza Altavini, a lawyer from UNIOESTE.

4.3.2 Technological Innovations Center (TIC)

The interviewee from NIT was the coordinator Selmo José Bonato, who said he is a systems analyst at UNIOESTE for over 24 years. He commented about the internal and external practices related to the ecosystem. He stated that they are strongly stimulating partnerships with companies, as well as the Coordination for the Improvement of Higher Education Personnel (CAPES) that has also been stimulating these partnerships from the academic masters and doctorate courses directed to innovation. He commented that, in 2020, thirteen partnerships were made and that, starting in 2021, this number should increase due to the master's and doctoral students who will have to elaborate the themes of their dissertations and theses that will lead to cooperation with companies. Selmo estimates an approximate number of 60 or more partnerships with this project.

Regarding the initiatives, the participant said that the university has a key role in society; however, it needed to open its doors, and this happened through the participation in the groups Iguassu Valley, RIS, and POD. In this way, the university has been getting closer to the productive, industrial, and agricultural sectors, from where the ideas of partnerships arose. As for the objectives, Selmo reports that the book of TIC indicators will be launched, and it will be the basis for the 2021 planning, to make a temporal analysis of its evolution and contribute with new strategies. Selmo believes that this action will be a great boost, as these indicators will contribute for the society, both internal and external, to look at the university in a positive way. In this context, Selmo cited examples related to costs and expenses, in patent registrations, and the return they give to the university. For example: in 2020, about R$9,000.00 were spent on intellectual properties; in return, the NIT got a donation from the State Revenue of R$77,000.00; approved a R$320,000.00 project with the Araucária Foundation; and approved a R$24,000.00 project with the Paraná Fund, that is, a total of R$521,000.00.

Regarding the main milestones of this process in our region, the interviewee comments on the importance of the university starting to worry about the innovation issue, such as, for example, the creation of Iguassu Valley as one of the main milestones in our region, with the support of several companies and public entities. He also stresses the importance of RIS in partnership with large cooperatives in our region, such as LAR, and also companies from other sectors. Another milestone considered by the participant is the creation of a Technological Innovation Agency that is being designed by the TIC. He said that this is an idea that has already been implemented in some institutions, such as the University of Campinas (UNICAMP) that transformed its TIC into INOVA, and UEL that created AINTEC. Each one with its own particularities due to the work performed according to each region, but with a similar purpose aimed at leveraging innovation.

The question was asked about how decisions were made and how the innovation ecosystem in the region was structured, and about the participants in the process. Selmo stated that the structuring of this system is being built with the help of SEBRAE and government initiatives with the support of the innovation policy. Selmo stressed that until a while ago there was no concern about having this kind of policy and that today municipalities have these policies, and the nuclei are forming and organizing themselves so that the innovation process can take place.

The interviewee reported that about four years ago, when studying Universities, he could identify that the whole ecosystem is moving and organizing itself for changes and innovations except the university. At that moment, he decided to develop the University 4.0

project, whose objective is to be concerned with these changes that he considers a matter of survival for universities. The project has already started at UNIOESTE and has about thirty-seven ways to generate its own resources for the university. He states the following: "the use of transportation applications such as "etaxi", "govitaxi", or "uberizar" generate more savings for the university. Selmo also commented on how much the government must have saved with universities in this pandemic period. He believes that when this phase is over, things will never be the same again. Another highlight of his project is the incentive for academics to do their end-of-course work focused on solutions in practice, for the market, or even for startup creation.

When Selmo was asked how the involvement among the participants occurs in this innovation ecosystem, he answered that the whole process brings great challenges, and one of them is to mobilize people to participate in this process. He commented that he started to value the movement only after the second year of his participations in the Iguassu Valley meetings, because he thought that before that he could not see anything that he could benefit from. Today he sees the importance of the ecosystem for the region, the participation of the public power and of several people who believe in this movement. He commented that due to the COVID 19 pandemic, there was a maturing of the movement. Several working groups were created that contributed to the supply and analysis of data, hospital equipment repair, and manufacturing and printing of 3D parts, as well as the making of masks and alcohol gel production. Another way to analyze the maturation of the movement was the expansion of Iguassu Valley to other cities, such as Marechal Cândido Rondon, Toledo, and Foz do Iguaçu. There were also conversations with people from the Southwest region of Paraná who showed interest in the opening of Iguassu Valley.

About UNIOESTE's role and characteristics, Selmo points out that, because it is a public university, it has a more rigid and selective faculty selection process, different from private Universities. It develops and creates master's and doctorate programs that enable the formation of a highly qualified technical body, and thus gets the best professors, considering that this makes the difference when it comes to embracing an innovative project.

Regarding the main elements in the university's practices that impact the innovation ecosystem, Selmo believes that the results of the projects directly impact innovation. He cites as examples the academic master's and doctorate projects. All dissertations and thesis will be directed to innovation with support from CAPES, since around one and a half million reais are distributed in scholarships for the training of masters and doctors in innovation.

The respondent was asked about the types of efforts UNIOESTE has made or makes to help create the innovation ecosystem, and he highlighted the participation with public

authorities in meetings, the increase in the number of patents registered at the university, the delivery of dissertations and thesis that engage in the market, the discussions related to the innovation law, and the participation in trade associations and class entities. He said that there are technological projects for the agricultural area in focus, such as the development of drones, robots, startups, the Agro On-line, and the electric car, and that they have also automated a press that generated biodiesel oil, among other projects that are in execution.

Regarding how and when UNIOESTE planned and structured itself to act in the innovation ecosystem, Selmo said that, through the TIC, they studied and made proposals, they made partnerships with CHEFEL university and two other Universities in Chile, and they visualized the possibility of creating startups, CO2 recovery, solar energy generation, among several other actions. However, he believes that there are still many actions that should be taken by the university, such as restructuring its processes, the way of teaching classes using active methodologies, and the realization of *hackathons* that, for UNIOESTE, are still a little distant; however, they contribute to faster solutions.

Selmo believes that due to UNIOESTE's participation in RIS and Iguassu Valley meetings, he noticed that companies are looking at the university in a different way, because he believes that the university is still seen by society as a mere "diploma manufacturer". However, the participant pointed out that the university has a much greater function than this. He also stated that entrepreneurs are starting to see the importance of having a master or doctor working in their companies and bringing innovations. He believes that, in the near future, there will be a shortage of masters and doctors to meet the demands that will arise. He also commented on the academic dropout rate, which tends to decrease, since students will feel more valued and will contribute more to the classroom.

It was asked how UNIOESTE finances and monetizes its research and commercialization practices, and Selmo answered that all technology developed at the university can be transferred. The TIC plays the role of registering the patents; it values the university's work; however, there is some difficulty in registering patents, not only in the UNIOESTE TIC, but in all TICs. He said that royalties and projects are ways to monetize, for example: the Vonal drug formula, developed by the University of São Paulo (USP), where 58% of the royalties belong to USP and brought the university approximately sixteen million reais. What did he mean by this? That this is a way to yield resources to the university. Nevertheless, this is the kind of opportunity little explored by UNIOESTE, that is, it is a challenge to be overcome.

In regard to how UNIOESTE influences the development of new ventures in Startups, Selmo stated that the university does not have this practice; however, with the implementation of the Innovation Agency, the idea is to create such opportunities. He commented that a proposal is being prepared, which will be presented to the state government, in the amount of one million reais. R$500,000.00 will be sought through partnerships with companies from Cascavel and the other R$500,000.00 with government subsidies, and the project's objective is to finance startups through UNIOESTE's initiative.

The participant was asked why the university decided to set up an innovation HUB, and he replied that, in fact, the idea of the innovation HUB is not new, that the State government had already started this process of creating containers that would be innovation HUBs. However, through an initiative of NUPEACE together with UNIMED, it was created the UNIOESTE's innovation HUB, which was a little "loose" in the process, because when we talk about innovation, the initiative should come from the TIC. However, the TIC has been remodeling itself to adapt to the new innovation situations that arise. The suggestion then was to create a technology center where everyone will work together towards the same goal.

When asked about the ways UNIOESTE stimulates entrepreneurship in the community, both for the internal and external public, Selmo said it is something new for the university. He explains that if there is no public notice or government resources, there will be no projects. He recalled that this is the first year that the entrepreneurial marathon is being held. Yet, it is worth remembering that, in 2019, some scholars participated in the first *hackathon* promoted by UNIMED, through their own initiative. He said that this difficulty exists; however, he believes that the resource made available for the marathon will stimulate the opening of new processes, because historically this was not encouraged within the university.

It was also asked about the management structure of UNIOESTE, if it is flexible and easy to access, so that bureaucracy is minimized and interaction among the actors of an innovation ecosystem is facilitated. The interviewee replied that there are difficulties in interacting due to the excessive bureaucracy and the processes that are hampered, for example, in the realization of a university/company partnership. There are several obstacles that hinder it because the internal processes take up from 6 to 8 months to be concluded and that, currently, the way to speed up a formalization occurs through the Research Development Foundation (FUNDEP). He also mentioned the legal issues that lead to the impediment of partnerships.

As for the challenges and conditioning factors to be overcome by UNIOESTE in developing this ecosystem, Selmo reinforces the reduction of bureaucracy. He said that they are also working on updating the resolutions; nonetheless, they face challenges related to the lack

of human resources, to the turnover among sectors, and to the lack of public competitions. Examples such as "today I'm here, tomorrow I'm not" indicate that one cannot count on good professionals for a long period. Therefore, he believes that it is not the employees who are to blame, but the way the university is structured.

Regarding the critical factors or barriers for the practices to be successful in the university/company cooperation process, Selmo considers UNIOESTE's lack of qualification and maturity when compared to universities from other countries. He cites that some professionals that work at UNIOESTE do not have access to the professional qualifications of the Europeans, for example.

As for the facilitating factors for the university/company cooperation process, the participant said that it is the initiative they have had in seeking partnerships with companies, the emergence of public edicts, and public funding, because he considers that if this type of funding does not exist, it is unlikely that companies will do it alone, because they expect the government's help in some way. Other factors considered are the dissemination of knowledge through the university and the support of SEBRAE.

For greater comprehensions in this study, Selmo believes that it is necessary to understand how UNIOESTE functions today. In his view, the university is in a different time from the private sector and the world, considering it backward. He emphasizes the need to update in order to become recognized by society and to survive. Selmo also mentioned some names of actors that can contribute to this study such as Ronan Medina and Jadson Siqueira from Iguassu Valley and Sérgio Altavini from ACIC.

4.3.3 Pro-Rectory of Administration and Finance (PRAF)

Still among the UNIOESTE participants, the lawyer Nilza Maria de Souza Altavini was also interviewed. She works in the Pro-Rectory of Administration and Finance (PRAF) department, in charge of the agreements directorate, whose sector is responsible for the intermediation of cooperation agreements of external entities with the university. Its activities are related to cooperation agreements for research in development, documents and terms of intellectual property adjustments, and transfer and technology contracts, which are elaborated by the TIC. Nilza reported that she decided to do a master's degree on intellectual property and technology transfer because she felt the need for more professionalization in this area, since her activities are related to innovation. She also considers the lack of structuring and methodology,

factors that led her to choose this master's program. She said that, currently, she has been working with the TIC in an attempt to organize and improve the innovation-oriented processes.

Regarding the internal and external practices related to the ecosystem, the respondent considers that the objectives are being achieved with the university/company cooperation, because the TIC has been carrying out activities related to innovation; however, the expected results are not being achieved yet. She considers that there is still much to be done, for example: preparation of legal instruments, statutes, regulations, institutional development plans, and implementation of an organizational culture among all involved, such as the university administration, professors, academics, and other sectors. She said that the university/company cooperation is due to the innovation aspect and that this is relatively recent at UNIOESTE.

Nilza commented how the cooperation between university/company has been made. She said that they occurred from the companies' own initiatives, because they heard comments on other ecosystems and then decided to seek UNIOESTE for a possible partnership, in order to develop projects and transfer technologies. She commented that UNIOESTE held meetings with companies that were known to be innovative. Graduate students and professors/researchers were also invited to participate in the meetings. There, the companies had the opportunity to present their activities, demands, and what they expect from the university. In this sense, professors and scholars started to work towards these demands. Thus, the exchange of technologies through the improvement of these companies' products was generated. The respondent mentioned that other practices were also carried out, such as CNPQ's edicts, with support from the master's and doctoral programs and partnerships with companies, where projects developed by the master's and/or doctoral students are presented to companies, and if there is interest, the project can be developed. She commented that there is always the participation of the university in meetings of the Iguassu Valley, calls from SEBRAE and several other movements that enable the opening of doors for UNIOESTE.

Among the main milestones of this process in our region, she highlights Iguassu Valley and the meetings of the municipal managing committee as very important. She considers that when all the actors involved unite, partnerships happen.

It was asked how decisions were made regarding the structure of the innovation ecosystem in the region and about the participants in the process. The interviewee reported that the participation of UNIOESTE is very important, she also considered extremely important the participation of PTI and SEBRAE, since SEBRAE is an organization that has access all over the world. She considered that UNIOESTE has leadership; however, it should publicize its activities more, so that everyone knows what it does.

She also questioned how the involvement among the participants in this innovation ecosystem occurs. For her, there is a lack of better organization and role definition, and she believes that "everyone is shooting in the same direction". She remarked that, from her own experience and the opportunities she has had to know other ecosystems, where there are government agencies, such as SEBRAE, Universities, Trade Associations, SESI, SENAI, SENAC, and private companies, the process flows very well, because the actors involved know what to do and each one does their part, without repeating what the other one is already doing.

In this scenario, the participant believes that, in general, the ecosystem of the Western region needs to be structured, that is, its functioning should be defined. She said that the players involved need to plan what they want for the future of the region, identifying the problems to be solved. This starts, for example, with primary and secondary education, as she believes that there should be the inclusion of subjects and activities that stimulate entrepreneurship. In this way, it is possible to raise the interest of young people in technology and innovation and, when they enter university, they will already have an entrepreneurial culture. She reinforced by saying that there is a lack of a more extended and collaborative management in the ecosystem and a single focus, because if today it is necessary to tell someone from the outside what the process of a venture in our ecosystem is like, and who can do it, she believes that there is no clear definition and no one who can be counted on correctly.

Regarding the role of UNIOESTE and its characteristics, the interviewee reported that the innovation context developed at the university is characteristic of Brazil, i.e., the development of research, the knowledge, and the basis for this are within the Universities. In other countries, in turn, there are specific research institutes, besides the Universities. Brazil has some research agencies, such as EMPRAPA and the Oswaldo Cruz Foundation, but they are exceptions.

The participant emphasizes that if knowledge and innovation are strategies for the development of a country, and these strategies come from scientific and technological research, then, the role of the university is essential, and it has been developing all this according to its structure and level of maturity. Nevertheless, he points out that there is still a lot to be done inside UNIOESTE. For example, today there is no identification to know how many, and which works have already been developed by its scholars, and which ones would have the potential to transfer technology and innovation and contribute to companies, new products, new services, and society in general. He points out that there are many researchers who do not even know that their work can be converted into technology and innovation.

About the main elements in the university practices that impact the innovation ecosystem, she said that knowledge is what impacts the most, i.e., the know-how and the production of people qualified to work in this area. However, UNIOESTE attracts and brings people from outside our region, training them and making them available to the market to produce innovation.

Regarding the types of efforts that UNIOESTE has made or is making to help create the innovation ecosystem, she mentions that the university is in the process of becoming aware of what it has already done and what more it can do; however, it could not dedicate itself exclusively to this. It is as if it is doing things with the "car in motion". She said that, recently, UNIOESTE formed an institutionalized commission to elaborate the internal innovation policy and the other necessary normative instruments, because, according to the changes in the new innovation law of 2016, there have been amendments to the constitution. This has impacted a number of other situations related to stimulating innovation, such as providing services, hiring researchers, bringing foreigners to the university, importing equipment, among others. Thus, the change in this law deals with all of this, and UNIOESTE has been working on its policies for the due adequacy.

It was questioned how and when UNIOESTE planned and structured itself to act in the innovation ecosystem and she answered that the TIC has existed for some time in the university and has an intellectual property regulation. In addition, it performs patents, and some technology transfer contracts; nonetheless, the structuring is in fact occurring with the help of the institutional commission. She commented that UNIOESTE has been searching for knowledge in other universities that are outstanding in the area of innovation for better efficiency. She stressed that, regardless of the instruments, what is possible is already being done. However, it must occur naturally and with legal security for the implementation of new methodologies for the academic community.

Nilza also reported that the formation of partnerships of the university with companies occurs through public agencies edicts, such as the CNPQ's edict for masters and doctorates. This enables the partnership with companies that will invest in scholarships for academics to develop projects of interest to the company. There is the TIC website as a kind of technological 'showcase' and the researchers participate in events where there are opportunities to close cooperation agreements with companies. There is also the possibility for researchers to develop research with researchers from other universities.

It was asked how UNIOESTE finances and monetizes its research and commercialization practices and the interviewee replied that the university does not have its

own resources. The resources come from funding agencies, such as CAPES, CNPQ, and Araucária Foundation. There are also technology transfer contracts, software that is licensed and or assigned and assigns technology exploitation rights, and it receives royalties.

Nilza informed that, regarding the way UNIOESTE influences the development of new ventures in startups, the simple fact that the university maintains contacts with researchers is considered a stimulus. However, formally, she considers the innovation HUB to be a strong stimulus for entrepreneurship and is even studying a regulation format for pre-incubators and technological incubators. Hence the reason why the university decided to set up an innovation HUB.

Regarding the ways that UNIOESTE stimulates entrepreneurship in the community, both for the internal and external public, he exemplified that the university offers internally some courses on entrepreneurship; however, they are still optional. Nevertheless, some courses have already integrated them in their curricula as mandatory courses, and in the master's and doctoral programs, entrepreneurship occurs in a more natural way. She considers that it is necessary to institutionalize it so that it is not just the "good will" of some professors in certain courses. Regarding the external public, the actions occur through the TIC and its participation in events and external meetings. Professors also participate as mentors at startups.

It was asked about the management structure of UNIOESTE, if it is flexible and easily accessible and if bureaucracies were minimized in order to facilitate the interaction between the actors of an innovation ecosystem. The participant said incisively that no, because she considers that thinking in terms of innovation, companies need agility because they aim to obtain profits, and the university, for being a public body, is subordinated to a slow legality. Therefore, no matter how much it wants to be agile, there is this obstacle. Notwithstanding, the innovation law of 2016 aimed to solve this issue and make it more flexible; however, he believes that it is not enough to make the law more flexible, but that the people who apply and enforce the law should update and understand this flexibility. He also commented that the flexibilization is not so simple, since it is monitored by the court of auditors and the Public Prosecutor's Office, as it is a strict legality.

Besides the stricter legislation issue, she reported on the structure of a public entity created in a bureaucratic way, i.e., a department does not have the autonomy to make decisions without having passed through the approval of several others, making the process more time consuming. She also reported some deficiencies that occur, such as the lack of new staff recruitment to replace retiring ones, which has generated an accumulation of functions and work overload, but also reports that there are many idle people who could contribute much more.

Regarding the challenges and conditioning factors to be overcome by UNIOESTE in the development of this ecosystem, the interviewee mentioned the overcoming of the cultural and organizational issues. She said that the other challenge is to make the managers understand and encourage all this, since they have the power of decision and guidance of internal policies. Another issue analyzed is that Universities are the greatest expectations in the interaction process of an innovation ecosystem; however, companies also need to review their cultures, because there is a certain fear of innovating due to the risks with fiscal and economic issues, but they must analyze that innovating can guarantee intangible gains, greater competitiveness, and consumer support, among many other advantages.

Regarding the critical factors or barriers for the practices to be successful in the university/company cooperation process, she highlights that the main factor is in fact the legal bureaucracy. This is due to its delay and to the fact that it normally cannot be done the way the company expects, because there is a clash of interests, since companies aim for profit and the university, in turn, is bound to a legality that may not always meet the companies' demands. In relation to the facilitating factors for the university/company cooperation process, the interviewee said that UNIOESTE has people with greater facility and in tune with the issues related to innovation, who, in a way, take the lead in the actions that provide the triggering of some processes, which are already underway.

For a better understanding of the role of the university within the innovation ecosystem in the region, the participant commented that innovation in Brazil is a relatively new subject and UNIOESTE is no different. She cited examples of universities that were ahead of the curve, such as USP and UNICAMP, which started their innovation processes long before the innovation law. However, it is necessary to remember its geographical location, which is a factor that favors its results. Nevertheless, UNIOESTE and the other universities are in search of institutionalization according to the innovation law.

The respondent also recommended some names of actors that could contribute with more information related to this study, such as Professor Maria da Piedade Araújo from NUPEACE, a representative from SEBRAE, a representative from TIC and Professor Camilo Freddy Mendoza Morejondo from the Toledo Campus, which is responsible for the largest number of patents at UNIOESTE (which, due to scheduling incompatibility, it was not possible to interview the professor). He informed that his agenda was full during the period when the interviews were carried out and therefore it was not possible to meet with him.

4.3.4 National Confederation of Medical Cooperatives of Cascavel (UNIMED)

A representative from the National Confederation of Medical Cooperatives of Cascavel (UNIMED) was interviewed to talk about the university/company partnership, Everton Antonio Garboça. He has been part of the institution for about nine years and works in the area called Project Nucleus, which has some pillars, such as strategic planning, quality, projects, and innovation.

Everton said that regarding internal and external practices related to the ecosystem, the partnership especially with UNIOESTE started in 2019, due to UNIMED's eagerness to get partnerships with universities, which is why they held the first *hackathon* in 2018 and the second one in 2019 in order to spark an alert that a partnership with a university would be positive for this kind of innovation project. From there, UNIMED first made a partnership with SEBRAE, as SEBRAE has been supported by it since the first *hackathons* and is also a partner of UNIOESTE, then becoming the bridge for the partnership between UNIMED and UNIOESTE. The first meeting for a possible partnership took place at the Digital Rural Show in 2019 and among the participants from UNIOESTE were professors Reginaldo, Maria da Piedade, and Geysler.

Concerning the main milestones of this process in our region, Everton said that the partnership between UNIMED and UNIOESTE allowed the academics to develop projects in the innovation HUB. He commented that, due to the pandemic, the processes have been a little slower because the scholars have not been going to the university; nevertheless, he believes that when this phase is over, the innovation production will leverage.

When asked about how the decisions and the structure of the innovation ecosystem in the region were made and about the participants in the process, Everton said that they have already participated in the weekly meetings of Iguassu Valley, but in a very punctual way. Therefore, the participant could not inform when the movements of the ecosystem started.

It was also asked how the involvement between participants in this innovation ecosystem occurs, and Everton answered that since the first *hackathon*, UNIMED was inserted in this ecosystem because it invited SEBRAE to be a partner, and then it involved other players, such as Iguassu Valley and other representatives. After the *hackathon*, UNIMED was invited to present its case at the Iguassu Valley meetings. However, the participant pointed out that they are only invited and do not hold meetings and do not participate in events, due to the time that impacts on UNIMED's internal service routine.

Regarding the role of UNIOESTE and its characteristics, Everton believes that the university began to leverage innovative projects as of 2019, because that was when he realized the issue of innovation being moved more effectively, especially when linked to the ecosystem. He mentioned again the example of the innovation HUB and its importance and commented about the entrepreneurial marathon held by the university, because there are meetings with defined periodicity. The marathon has several challenges in which the scholars are working with the participation of market players. The interviewee analyzes that the university role is to make available the thinking mass that comes through academics, researchers, and professors, because companies have problems and cannot innovate, and UNIOESTE has the knowledge; thus, it needs to make the connection with the market, even to give scholars the opportunity to experience the practice or even, perhaps, to move the job issue for these people.

Regarding the main elements in the university practices that impact the innovation ecosystem, Everton analyzes the issue of linking theory to practice, since he considers the undergraduate and graduate courses to be somewhat theoretical. He believes that the link with the ecosystem brings the dynamics of understanding what exists in theory; however, it is necessary to apply it in practice. Everton considers practice to be more important, besides the link with companies and the market, which consequently helps companies not only in terms of innovation, but also in their business management.

Regarding the types of efforts that UNIOESTE has made or is making to help create the innovation ecosystem, Everton believes it is from the projects that are being carried out, such as the entrepreneurial marathons and *hackathons*, which move the entire ecosystem and connect to the market and companies. The respondent commented that, depending on the teams' performance, they can be hired by companies to finalize the solution. This way, a startup or a new company is generated, moving not only the ecosystem, but an entire regional economy. It was also asked about how and when UNIOESTE planned and structured itself to act in the innovation ecosystem; however, the participant could not answer because this is an internal UNIOESTE matter.

Regarding the university's partnerships with companies, the participant explained how it was with UNIMED and UNIOESTE. The partnership began with a first meeting with UNIOESTE professors at the Digital Rural Show in 2019. It was idealized how this partnership could occur, and after some conversations, it was understood that the best way would be to create a physical environment inside UNIOESTE, which was then called the Innovation Hub, where UNIMED would take its problems to be studied and solved by UNIOESTE's academics and researchers. After this decision, the formalizations were made through a cooperation term

between UNIMED, SEBRAE, and UNIOESTE. The interviewee commented that there was a delay in the conclusion of the partnership formalization due to the involvement of the legal area and the various adjustments needed to be made in the room's structure. Thus, the partnership effectively began in 2020. At the time, UNIMED contributed financially to make the adaptations of the room, such as furniture and decoration, to make the room more aligned with innovation characteristics. UNIOESTE's part happens through the willingness of its academics and researchers to work on the demands coming from UNIMED, and SEBRAE contributes with consulting and know-how for the development of projects within this HUB.

When asked on how UNIOESTE finances and monetizes its research and commercialization practices, the participant stated that he could not answer how such practices occur at the university, but he mentioned that at UNIMED, they happen by stimulating the team that is inside the HUB. There is a deadline to deliver the project prototype, and from then on, UNIMED decides whether to hire or not the project sent. If the project is approved, a contract is made, and an amount is negotiated directly with the team to buy the solution. Everton commented that, in this case, UNIOESTE will not receive any financial value.

He was also questioned about how UNIOESTE influences the development of new ventures in startups, and he explained that there are academics from various courses who have various skills. They learn the theory to later apply it in practice; thus, UNIOESTE has acted as an intermediary, because it brings scholars closer to the problems and needs of the market. Consequently, the economy is potentialized and brings a series of important guidelines for the local society.

It was also asked why the university decided to set up an innovation HUB. According to Everton, it is a physical space to draw scholars' attention, because if UNIMED only takes a problem to be solved by the students at the university, it may be that without a specific place, the challenge is not so attractive to them. On the other hand, when there is a prepared space, with a differentiated model, with walls where you can write on, and furniture that promotes innovation, it becomes an "attraction". The HUB comes for this, that is, it is an atypical space for the academics to think about innovation, different from a regular classroom.

Regarding the ways that UNIOESTE stimulates entrepreneurship in the community, both for the internal and external public, there are university programs and projects that become a link between business and society challenges for the development of innovation.

When asked about UNIOESTE's management structure, whether it is flexible and easily accessible, and whether it is able to minimize bureaucracy in order to facilitate the interaction between the actors of an innovation ecosystem, Everton replied that when it comes to the

partnership between the university and UNIMED, regarding the people who were needed for the meetings, especially the professors involved, there was no problem. On the contrary, they were very open and receptive; therefore, there is flexibility on the relational issue. On the formality issue, he said he is not flexible, since the university needs to comply with rules and laws, just like every public institution.

Regarding the challenges and conditioning factors to be overcome by UNIOESTE in the development of this ecosystem, Everton points out that UNIMED had to learn to work with public entities, because in order to be able to set up a structure within the university it was necessary to go through several internal processes, such as FUNDEP's approval, the participation in the public notice and the issues related to documentation that are specific to UNIOESTE. He considers all of this a great challenge, because in the business world people work in a more flexible and faster way. He also mentioned another challenge that was not foreseen and is out of control, the COVID-19 pandemic, which caused scholars not to have in-person classes; consequently, this impacted the expected result of the 2020 projects. Thus, it was necessary to resort to adaptations such as online meetings in order to motivate them even if they could not go to the HUB room, and this was a way not to let the project die.

As for the critical factors or barriers for the practices to be successful in the university/company cooperation process, Everton stressed the documental issue as being too bureaucratic. Another factor already mentioned was the pandemic that prevented some satisfactory results in 2020; he also mentioned the lack of experience of the academics in relation to the market, generating slowness in the development of the solutions demanded by the companies; therefore, companies need to be a little more patient with this factor.

In relation to the facilitating factors for the university/company cooperation process, Everton reported that, from the first moment, when the idea of partnerships was born, UNIOESTE received UNIMED in a very open way, showing interest. He also highlighted the importance of the availability and attention of some people within the university that are always contributing and helping so that the processes happen and the communication between university/company is facilitated.

Everton evaluates that UNIOESTE has a wealth of knowledge in other courses besides the areas of Applied Social Sciences, such as Medicine, Pharmacy, Physiotherapy, and others for greater contributions to the university's role within the innovation ecosystem in the region, which could be inserted in the dynamics of making partnerships with companies, moving the market even more through these projects.

The participant also suggested interviewing others involved in the ecosystem, such as Osvaldo César Brottodo, from SEBRAE, as he is an agent with a lot of knowledge in terms of the ecosystem and partnerships between companies and can bring a lot of important information (as a representative of SEBRAE, it was possible to conduct the interview with Alan Debus).

4.3.5 Iguassu Valley

Ronan Medina was one of the interviewees of the Iguassu Valley movement, coordinator of the movement in Cascavel. According to him, Iguassu Valley represents people, companies, and entities that are part of the ecosystem. It appears to be a large association related to innovation, as it is a tripod composed of private companies, government, and educational institutions. UNIOESTE enters this tripod as a fundamental organ. Renan explains that there is no other developed innovation ecosystem that does not have a strong university as a partner. Thus, he considers UNIOESTE's cooperation crucial to have an innovative region.

Concerning the internal and external practices related to the ecosystem, Ronan commented that the cooperation between university and company has increased in recent years. A business-oriented ecosystem related to innovations and technologies is being developed around it. He said that the Iguassu Valley movement was born from weekly meetings at the Cascavel Commercial Association (ACIC), through entrepreneurs from the IT nucleus and started to grow with the participation of entrepreneurs from other areas. Therefore, the following step was to bring the universities and other teaching institutions to complete the tripod. From then on, Iguassu Valley started to invite professors, especially those from UNIOESTE, to participate, thus generating more engagement. The respondent commented that after the participation of UNIOESTE in Iguassu Valley's movement he observed that its professors started to get support from society to develop entrepreneurship in the institution.

Ronan pointed out that in recent years he has seen both the TIC and the UNI doing more actions of the university with companies. Some examples are events with master's and/or doctoral students to hear the demands of entrepreneurs. From this, dissertations and theses aimed at business solutions are proposed. They have also made partnerships with energy companies and pre-incubation processes for the startups that went through the UNIMED *hackathon*. Ronan said that these were some of the university's initiatives that occurred thanks to its involvement with Iguassu Valley, viewing it as a business demand.

In relation to the main milestones of this process in our region, Ronan believes to be the actions that take place inside the companies themselves with the partnership of the university. He mentioned that some entrepreneurs used to see UNIOESTE as a highly segregated space, which does not want to partner with companies and that develops a science that does not suit Cascavel or the region. However, with the work of master's degree students in organizations, it was noticed that this perception started to change.

Ronan cited UNIOESTE's participation at the national level in the Digital Rural Show, considered one of the biggest technology and innovation events in the country, and is among the biggest events in agribusiness. Several entities participate in it, and he mentioned TechInovação as another great event in the region. There are also actions that are carried out by the UNI, such as helping those who want to be entrepreneurs, taking the first steps, and getting their ideas off the paper, turning them into new businesses. These are companies started in Cascavel that will generate more jobs with higher added value, besides bringing more resources to the city and region.

The interviewee extended his speech according to his knowledge that Cascavel and the region depend on commodities. This is very good; however, this dependence is cyclical, because there will be moments that will not be so good, just like any other market. He believes it is important to diversify, citing as an example technology exports via services and products, i.e., they will bring more money to our region and help diversify revenue sources, generating more value-added jobs.

When asked about how the decisions were made and the structure of the innovation ecosystem in the region and the participants in the process, Ronan said that since it was only the IT hub of ACIC, and that this alone did not make much sense, and the issues were exhausted there, they started to reflect on what our region really needed, i.e., what is still not developed here. From there, the idea of developing technology and innovation emerged. Then, the group decided to change the name to Iguassu Valley, which started as a regional hub, because Cascavel is little known outside Paraná, unlike the word Iguaçu, which is internationally recognized due to the Iguaçu Falls. In the sequence, they defined the word "Valley" inspired by Silicon Valley and due to the characteristics of the region, which is almost the same size as our western region. He informed that, after some definitions, they started studying other innovation ecosystems in Brazil and in the world, such as in London, Shenzen in China, Florianópolis, Recife, and Silicon Valley itself. And from there, they started the connections with the actors involved in the ecosystem today.

Regarding the involvement of participants in this innovation ecosystem, Ronan said that it is organic, and the generation of business happens in the movement's own weekly meetings, as the participants can make presentations related to innovation that inspire other participants with the same goal, thus creating partnerships. He also commented that Iguassu Valley has no Corporate Taxpayer Registry (CNPJ) and that the only formality is to obtain a coordinator allocated to each city so that the information is centralized and to help maintain the movement's synergy.

According to Ronan, UNIOESTE has two essential roles among its characteristics in the innovation ecosystem: talent formation and the entrepreneurial culture. In the formation of talent, in order to have an innovation and technology pole, the agents need to be trained to do science in this area. In relation to the culture of entrepreneurship, the university is capable of developing people's way of thinking, solving problems, undertaking, and generating business.

In his vision, Ronan states that the main elements present in the university's practices that impact the innovation ecosystem are as follows: the actions coordinated by Professor Maria da Piedade, responsible for doing a rather cultural work, showing the path of entrepreneurship to those who are interested. He also explained the TIC, responsible for connecting the academics and other UNIOESTE talents with companies, generating innovation in practice. There are also the professional master's degrees that are increasingly connected to companies, and one example is Computer Science.

It was asked about the kinds of efforts that UNIOESTE did or does to help in creating the innovation ecosystem and, according to Ronan, UNIOESTE is represented by the people and, in terms of the institution, the efforts occur from the authorizations for these people to participate in the Iguassu Valley meetings, in order to hold events and get in touch with companies and develop themselves, allowing them to bring people not only from the university to develop their ideas about entrepreneurship. This way, the TIC can look for partner companies to make a connection with the university. And the result of these actions in education occurs so that the academics can do their work conclusions in the companies.

In relation to how and when UNIOESTE planned and structured itself to act in the innovation ecosystem, Ronan believes that it has been happening through people's participation and that there is no defined structuring, but that the way it is, it works very well, and people are playing their roles.

About the university's partnerships, Ronan said that, due to the bureaucracy, the institution suffers to make partnerships and speed up processes with companies. He said that in this case, for making formalization more agile, the partnerships are being carried out by

FUNDEP. He justifies that bureaucracy is not UNIOESTE's fault but rather a system that is already in place. He points out that there are other ways to make the university self-sustainable, such as paid services that can be provided to society; however, they are not allowed due to legal and/or cultural issues.

Regarding the way UNIOESTE finances and monetizes its research and commercialization practices, Ronan believes that there is very little, close to the potential that could be generated. He cited examples of conversations he had with Selmo from TIC, regarding patent revenues that are around R$ 100,000.00 or R$ 200,000.00, but not reaching R$ 300,000.00 per year, i.e., the return is small when compared to the investments. An example is the University of Pernambuco, which has already made more than 30 or 40 billion reais through partnerships with companies. The actor believes that UNIOESTE can reach this level but needs institutional support via corporation through debureaucratization. He pointed out that there are people inside the university who want to make it sustainable and in the style of universities in developed countries; however, it is still a slow process.

According to Ronan, UNIOESTE influences the development of new ventures in Startups, through pre-incubation and projects supported by the TIC in the development of solutions to companies, carried out by academics. He said that, for some companies, it is not always interesting for them to take responsibility for this kind of project, which are in the hands of entrepreneurial students who can turn them into businesses. A practical example mentioned by Ronan was about the COOPAVEL Cooperative, because if a project costs R$500,000.00 for it, it is not worth the effort to commit and execute it, when considering its annual turnover that is around three million. Therefore, the company partners with the educational institution and the scholars develop the project and can generate solutions for other companies and the emergence of a new enterprise.

Ronan raised the following question: and if there were no such actions, what would happen? The same that happened in Recife in the 1970's and 1980's, when there was also an informatics nucleus that formed great talents in the area; however, they would leave to work abroad, that is, these talents would develop and generate revenue and income elsewhere, and the region where they graduated would become just an exporter of talents, lacking the local Human Development Index (HDI). He also cited another example of a specific class with almost 40 computer science students from UFPE in late 1980s, when practically all the students left to work at Itaú company in São Paulo. It was then that Recife had a reality shock and decided to retain its talents. In this context, Ronan stressed the issue of UNIOESTE, for if it does not take this path, the talents trained there will leave.

The reason why the university decided to set up an innovation HUB was questioned, and Ronan said he believes that UNIOESTE has started to understand that it needs to open up more to society. He considers it a challenge to be overcome and has the impression that UNIOESTE lives in its world, that is, of training scientists who develop a science whose purpose is not understood by the region. A science that does not reach the consumer, that does not see the return for the local society; therefore, we ask the following question: is this cost worth it? Well, it is high, it comes out of taxes, and a great part of our income sustains UNIOESTE. Ronan pointed out that most of Cascavel's population thinks that UNIOESTE gives back less than expected. He considered that for the parents whose children study there, it is good; however, for those who do not study there, they cannot see the benefits and advantages that it provides to society. In this sense, the importance of the innovation HUB is justified, as it is able to provide this interaction.

Regarding the ways UNIOESTE stimulates entrepreneurship in the community for both the internal and external public, Ronan said it is through the programs conducted by NUPEACE and TIC, especially those that are open to the community.

When the interviewee was asked about the management structure of UNIOESTE, if it is flexible and easily accessible and if it is able to minimize bureaucracy in order to ease the interaction between the actors of an innovation ecosystem, the respondent said no, but that maybe it is not UNIOESTE's fault. However, he asks the governing body to work to alleviate this issue, because he believes that they are the ones who can demand a more flexible law.

Regarding the challenges and conditioning factors to be overcome by UNIOESTE in developing this ecosystem, Ronan points out that it is necessary to develop the internal culture, because he believes that over the years a culture in which the university cannot do external business, and should only generate education, has been implanted. He considers that this culture is rooted in most of his community. However, he notes that there is a good portion of the academic community that visualizes that education can generate business and "reach" consumers. He points out that there is no innovation without generating the fiscal note, because "there is no point in making a vaccine against the coronavirus if this vaccine cannot reach those who need to be vaccinated. In short, business generation is necessary.

About the critical factors and barriers for successful practices in the university/company cooperation process, Ronan reinforced that the barriers have been bureaucracy and again cultural issues. This is because, when talking with some colleagues at the university, he believes that there is resistance when talking about running programs involving entrepreneurship and/or doing business and partnerships with companies. In relation to the facilitating factors for the

university/company cooperation process, the participant said that there have been few. He believes that the biggest facilitator has been FUNDEP, because it does not have the same rules and bureaucracies as the university.

Concerning a greater understanding of the university's role in the innovation ecosystem in the region, Ronan summarizes that there are no developed ecosystems in Brazil and in the world that do not include a strong university; therefore, UNIOESTE's participation in the development of our region is necessary, working together with the other actors.

When requesting some recommendations from other people who he believes should be consulted as part of this study, Ronan mentioned Alan Debus from SEBRAE, Jadson Siqueira as one of the representatives from Iguassu Valley, a representative from COOPAVEL, FUNDETEC, through Fabrício Barbie, the current director, or Aline Conti, who has been there longer, UNIMED, the people from PTI, Professor Maria da Piedade Araújo, and Professor Reginaldo dos Santos, from UNIOESTE.

4.3.6 Regional Innovation System (RIS) of Western Paraná

This section presents the interview with Jadson Siqueira, co-founder of Alfacon (educational services website specializing in video lessons focused on state and federal public tenders). He is the marketing and technology director and was one of the first founders and coordinator of the Iguassu Valley movement in Cascavel. He currently coordinates the RIS movement in western Paraná, but said he continues to help expand the Iguassu Valley movement in cities in the western region, as well as in Cascavel, Foz do Iguaçu, Toledo, Palotina, Marechal Cândido Rondon, and Medianeira.

According to Jadson, SRI interactions occur mainly in large companies and cooperatives in the region; however, those in Iguassu Valley focus on startups. Nevertheless, universities participate in both movements. He commented that, in the movements, there is a well spread governance present on a daily basis, executing strategic actions through weekly meetings in each of their cities.

About internal and external practices related to the ecosystem, Jadson said that the university/company cooperation has increased in recent years. The development of ecosystems focused on businesses that involve innovation and technology in their surroundings are examples of this: the first formal partnership that Alfacon made with UNIOESTE through a public notice, with the support of Iguassu Valley. Jadson reported that he acts as an advisor for

some masters' degrees in the area of computing, in order to develop new fronts in his e-learning platform. Other informal interactions also occur, such as visits from the company to the university and vice-versa, to hire trainees, and lectures in partnership with the Economics course. Jadson highlights that UNIOESTE is one of the key players in the ecosystem along with Iguassu Valley. He commented on the importance and engagement of some teachers who actively participate in the ecosystem, such as Professor Maria da Piedade and Professors Reginaldo Ferreira Santos, Luiz Antônio Rodrigues, Aníbal Mantovani Diniz, Cláudio Antônio Rojo, Jerry Adriani Johann, and others.

The participant also talked about the agreement that UNIOESTE signed with Iguassu Valley for the development of a project called DataLab, which aims to create data science competencies in our region. He pointed out that there are demands in this area, but there is a lack of qualified professionals not only in our region, but worldwide. This thought gave rise to the need to do something more conscious and active for the creation and retention of these talents in our region. Otherwise, it will perish from critical mass and modernization in business, considering that UNIOESTE is the center of the project's development with the help of its computer science course.

Jadson also pointed out that the creation of Iguassu Valley Cascavel was one of the main milestones of this process in our region, which emerged from the IT hub. He states that they realized the need to develop something different, more attractive, enterprising, modern, and linked to innovation, so they decided to transform the IT hub into the movement it is today. For the movement to work, Jadson says it was necessary to follow some principles from other places, based on some books such as Startup Communities and Startup Cities, which talk about communities of ecosystems led by entrepreneurs.

After establishing the principles of Iguassu Valley Cascavel, it was possible to expand the movement to the other cities that exist in the region today. All the same principles were followed, including one of the main principles, leadership by entrepreneurs, because they are the ones who suffer the pain, make the investments, and commit to the long term, contributing and then receiving. He points out that the movement cannot be formed by "small gaggles", since diversity is important, and everyone has the right to express their opinions. Jadson highlighted two other principles, which were idealized internally: the promotion of events such as *hackathons* and the creation of investment funds. It is worth mentioning that right at the beginning, the Angels fund was created, among several other activities.

He commented on another much-discussed issue, which was the definition of the name Iguassu Valley, because, as it was a movement that was born in a Trade Association, some

people argued that it had to have the name of the city. However, Jadson defended it by saying that, although we are in Cascavel, the name needed to be representative of the region. He cited the example of the Silicon Valley, where no one gets the flag of the city of San Francisco, hence the name Silicon Valley. Still on the same example, Jadson commented on the extension of the region, as being similar to ours when it is possible to move from one city to another and return on the same day due to their proximity.

The participant puts RIS, which precedes the Iguassu Valley movement, in the background, but also as a milestone in our region. RIS is linked to the POD, which is a more political arrangement focused on infrastructure and strategic programs. Jadson informs that the RIS is the innovation "arm" of the POD; however, the RIS has gained some independence and has been "infected" by Iguassu Valley. He believes that the second milestone was understanding that Iguassu Valley is effectively regional and joining forces with the RIS movement.

It was asked how the decisions and structures of the innovation ecosystem in the region were made and about the participants in the process, and Jadson answered that it was multidisciplinary and exclusive according to the principles that govern the ecosystem, involving several areas in technological development. Jadson took the opportunity to explain a little about the technology concept. He informed that when talking about technology one tends to think that it is directly related to information technology. However, it is much more than that, technology is the innovation methodology that improves the way of doing things, regardless of the area.

He also pointed out that there has always been the principle of democratic inclusiveness. All decisions are discussed transparently, and that at certain times someone has to "pull" the leadership, but that there is no formal voting. People talk to each other and come to a consensus. Among the participants are entrepreneurs from large, medium, and small companies, startups, government representatives, and FUNDETEC from Cascavel, considered to be a major player in the ecosystem. It has an incubator and agreements with UNIOESTE; UNIMED in partnership with UNIOESTE, which even developed an innovation center within the university; the Digital Rural Show was another event organized by the whole community; besides the creation of the ACIC LABS that was also born from Iguassu Valley and today is a HUB of innovation within the Commercial Association of Cascavel, focused on connecting startups and innovative projects. Therefore, there are several actions led by Iguassu Valley members, but without a formal organization.

According to Jadson, the goal is for Iguassu Valley and RIS to be the governance of the ecosystem, making them more organized through the participating entities. Jadson also commented that the search for knowledge in other ecosystems is constant. He mentioned some

private missions he has done in ecosystems around the world in search of experiences, such as in Silicon Valley in the United States, and some in Europe, France, England, and Hong Kong. He also talked about the missions that other members have done in Israel, Germany, as well as in Silicon Valley. He said that these experiences are analyzed and what is possible is applied to our ecosystem in an organic manner.

It was also asked how the involvement among the participants occurs in this innovation ecosystem and Jadson said that the main point is the weekly meetings of Iguassu Valley and the bimonthly meetings of RIS.

Regarding UNIOESTE's role and its characteristics, Jadson reported that, according to his studies, there is no relevant innovation ecosystem in the world that is not associated with large Universities. For example, in Hong Kong's technological park, the Technologic Science Park, there are seven co-founding universities; in Silicon Valley, there is the participation of the two largest American universities, Stanford and Varteling, among several other universities; in the Brazilian ecosystems, he cited the one in Recife that counts with the participation of UFPE and the one in Florianópolis with the participation of the Federal University of Santa Catarina (UFSC). Therefore, he considers that the participation of universities in innovation ecosystems is essential because that is where the basic research for science and technology is located, since innovations emerge through this research. Jadson also commented that in the past there was business prejudice, because the university was not concerned with solving real problems and served only to produce articles. On the other side, there was the university's prejudice that said companies were only interested in generating profits; However, this has been overcome in our region, and currently there are several partnership projects between universities and companies in our ecosystem.

Regarding the main elements in the university's practices that impact the innovation ecosystem, Jadson said that they are innovation and the pursuit of science in order to become products in the companies. The production of qualified labor, often wrongly seen by outsiders as the product that a master's or doctorate generates, is not simply a dissertation or a thesis. It is the formation of a professional capable of solving business problems with a differentiated view. Another important element is the democratic way in which universities work, regardless of whether they are public or private, and this contributes to the creation of an ecosystem.

Regarding the kinds of efforts UNIOESTE has made or is making to help create the innovation ecosystem, Jadson highlighted the participation of some professors who have taken part and helped direct the ecosystem, such as Professors Sandra Mara Stocker Lago and Maria da Piedade, and Professors Reginaldo Ferreira Santos, Jerry Adriani Johann, among others. He

commented that the university professor has the domain to analyze and explain how things work and are excellent connectors to the ecosystem.

The interviewee was asked about how and when UNIOESTE planned and structured itself to act in the innovation ecosystem and he answered that he did not participate in its organization; therefore, he could not inform, but he believes that it was also in an organic way. He took the opportunity to explain how the seminars between entrepreneurs take place during the Iguassu Valley meetings. He said that once a month an entrepreneur is invited to tell his trajectory, the story of his company's creation, and the main challenges he has already faced. In these events, academics and professors from the Universities are also invited to participate, because it is believed that, with these stories, inspirations occur that lead to innovation, which generate great impacts for the region. The entrepreneurship and innovation centers are examples of this and were created by the initiative of some professors. It was also realized that innovation needs to be open, otherwise it will not work, because the collaborative way is very strong. Jadson quoted an excerpt from the book Leans Startups, where the author Erik Ries talks about the startup way to apply in corporations, the so-called open innovation, and stressed that this must happen in universities as well, that is, innovate in an open way, inviting the community to participate.

About the university's partnerships with companies, Jadson said he is aware of those that participated through public notices. However, he highlighted the participation of UNIOESTE's professors and the current dean in the Iguassu Valley meetings, who was also present at the signing of the agreement with the state government for the creation of DataLab. Therefore, the dean is considerably aware of Iguassu Valley, knows what open innovation is, and knows about the need to connect large companies with small ones.

The interviewee was asked how UNIOESTE finances and monetizes its research and commercialization practices, and he replied that the edicts are still the main means, through development agencies such as the Araucária Foundation of Paraná State, the CNPQ, and the Ministry of Science and Technology, which is Federal. These edicts are already published. Thus, in order to participate in an edict, it is necessary to have a private company together with the university. This is a movement of the government to encourage partnership between companies and universities. Jadson affirmed that the idea is also to develop projects that are self-sustainable and that can generate their own revenue.

Regarding the way UNIOESTE influences the development of new enterprises and startups, the participant initially highlighted the training of human resources, which will be technicians, managers, and strategists, and then through specific agencies, junior enterprises,

accelerators, and innovation hubs, such as the one at UNIMED. He explained that there are other actions that the university performs to connect to the market, such as helping in the formation of companies.

Asked why the university decided to set up an innovation HUB, the participant's answer was that when he started getting involved with innovation in our region, he missed something he had been involved with in England when he lived there. The so-called meetups are meetings with technical themes, in which specific topics are discussed, to provide faster learning for the participants and many exchanges of ideas. Thus, he decided to implement meetups (meetings to exchange ideas) within Alfacon and later at Iguassu Valley. As for the university, there are many similar actions that can be performed from projects open to the community, thus generating companies' perception, and the innovation hubs enter this stage.

The participant emphasized the need to engage with anchor companies, which make more than a billion dollars a year and are publicly traded. However, he said that in our region there are no such companies. He cited as close examples the agro-industrial cooperatives that are, in a way, publicly traded and are extremely important according to the strength of their bylaws and their investment capacity in the region. He commented that when you pair such a company with a startup or with the university, it can increase the hit rate of the startup and of a product generated at the university. Therefore, it is possible to measure the maturity of an ecosystem by the number of anchor companies engaged.

Jadson took the opportunity to mention companies that have been acquired in our region by open capital such as Alfacon and Softpharma (specialized in software and process consulting for individual pharmacies and chains). He also commented on the cooperatives that already work with open innovation and connect to universities and startups, such as the expansion of LAR's open innovation movement; the creation of FRIMESA's and COOPAVEL's open innovation, along with the Digital Rural Show. Therefore, he considers that they are not giant markets such as Google and Apple; however, he considers that we already have a good level of maturity of the engagement of these anchor companies as references in our region.

Regarding the ways UNIOESTE stimulates entrepreneurship in the community, Jadson stated that, for the internal public, there are lectures about entrepreneurship and the inclusion of the subject in some courses, and, regarding the external public, entrepreneurship occurs from the extension projects, such as the *hackathons* and the TIC efforts.

When the participant was asked about UNIOESTE's management structure, whether it is flexible and easily accessible, and able to minimize bureaucracy in order to facilitate the interaction between the actors of an innovation ecosystem, he replied that he believes it is not

easy, as is the case with any large company. He could not answer precisely, but as he was a professor at the Federal University of Paraná (UFPR), he knows the excess of bureaucracy, and this gets in the way when you need agility. However, he took the opportunity to thank the professors who are always engaged in the ecosystem, because as he knows, there are situations in which some professionals prefer to stay in their 'comfort zone'.

As for the challenges and conditioning factors to be overcome by UNIOESTE in the development of this ecosystem, Jadson said that the main challenge has already been overcome: the prejudice from both the business side and the university side, for both did not see the importance of the university/company cooperation.

Regarding the critical factors and barriers for the practices to be successful in the university/company cooperation process, Jadson believes that one of the factors was the mentality of some professors. In this phase, there was help from Iguassu Valley in showing what was being done in other ecosystems. For this, the professors embarked on some missions, such as a visit to Porto Digital in Recife and Santa Catarina, to learn how companies and universities integrate there, so they can then apply it here. He took the opportunity to mention a positive experience he had during a visit to UFPE. He said there is a pro-business stance that is very different from any other university he has seen. He was surprised by the professionalism and the fierce way they seek resources from private enterprise to put inside the university. He commented that the University of Pernambuco is one of the examples in Brazil and in the world in terms of innovation, and it was turned into a reality of digital entrepreneurship.

Regarding the facilitating factors for the university/company cooperation process, Jadson mentioned the very existence of Iguassu Valley, which provides through its weekly meetings the possibility of connecting with companies, universities, and other entities.

To better understand the role of the university in the innovation ecosystem in the region, Jadson stated that the main thing is to look at new ecosystems and their functionality, without forgetting their particularities, cultural limitations, infrastructure, and logistics. For example, in our reality, there is a "weight" in the training of doctors and masters in the humanities and arts, and little weight in engineering and applied sciences. Jadson believes that these are limitations that need to be resolved little by little, that is, by scaling up efforts as difficulties arise. He also commented on the importance of constantly monitoring the players of the moment, because not long ago we were in the open innovation phase, and now we are already in the data science phase, that is, the players' evolutions can guarantee new industries, new markets, new products, and new opportunities for the region, but we need to be fast.

The participant also recommended some names of actors who could contribute with additional information related to this study, such as Ronan, the current coordinator of Iguassu Valley, and the other coordinators of the regional Iguassu Valley, such as Juliana from Marechal Cândido Rondon's Iguassu Valley. As for names associated with technology parks, he mentioned Paulo from Bioparque, Rodrigo Regis from PTI, and Alcione from FUNDETEC. He also believes it would be interesting to talk to some startup representatives (due to the time limit for this work, it was not possible to interview startups).

4.3.7 Brazilian Service of Support to Micro and Small Enterprises (SEBRAE)

Regarding SEBRAE, which has partnerships with UNIOESTE, such as the Startup PR Project, the Potentialization Project, and Entrepreneurship Education, the interview was conducted with Alan Debus, responsible for the innovation and projects area.

Regarding internal and external practices related to the ecosystem, Alan considers that the cooperation between university/business has increased in recent years. A business-oriented ecosystem related to innovation and technology is being developed around it. He took the opportunity to mention a very important action that they carried out with UNIOESTE and UNIMED, which was the innovation HUB. He pointed out that all the articulation was done by SEBRAE in order to reinforce a partnership that already existed between UNIMED and UNIOESTE. Then, SEBRAE held two *hackathons* with UNIMED, and with this articulation between UNIOESTE and SEBRAE, he suggested that UNIMED along with UNIOESTE provided a space and mentors so that they could develop projects coming from the *hackathons*.

SEBRAE also acts as a UNIOESTE's connection agent, supporting the TIC in projects that make grants available, through the dissemination of opportunities via public notices. And by connecting with companies, they stimulate them to participate in UNIOESTE's proposals. He informed that, when necessary, some company or startup can connect and partner with another startup that is already being served by the TIC. Thus, SEBRAE helps in this approach together with the university.

The interviewee was asked about the main milestones of this process in our region, and he talked about the installation of UNIHUB and the partnership of UNIOESTE with the ecosystem. He also mentioned other partnerships between educational institutions and companies, such as UFPR with the Biopark and Uniamérica with the LAR Cooperative.

On how decisions were made and the structure of the innovation ecosystem in the region and the participants in the process, Alan pointed out that when talking about structure, it is necessary to talk about the RIS, because he believes it is an essential support system together with SEBRAE, which stimulates the creation of ecosystem governance through the POD, implemented in 2014. In 2015, the technical chambers were created and identified some needs in logistics, energy, and innovation, and then RIS was born.

According to Alan, starting in 2016, this governance was created supported by SEBRAE, which held the invitations and provided its management. In 2017, it started to meet some innovation and technology demands of the technical chambers, also called productive chains, and in mid-2018, SEBRAE bet on financial and economic resources and expanded the scope of the innovation system, besides including more partners, mainly the region's Triple Helix. He said that RIS currently has fifteen working groups with around 60 active members throughout the region, which meet periodically. The objectives are to stimulate, connect, and monitor innovation in the region. Alan emphasized some of RIS's actions, such as the book of indicators that has been measuring innovation in an unprecedented way in the region for two years. He cited the creation of nine work groups exclusively to deal with COVID-19 related issues, with approximately 400 people involved. He said that UNIOESTE is one of the main partners within this governance and has participated assiduously, proposing, coordinating, and disseminating some actions.

When Alan was asked about how the involvement between the participants in the innovation ecosystem occurs, he replied that it takes place with the participation in in-person and non-in-person meetings, for example. Selmo, a UNIOESTE professional who works at Cascavel's TIC, is the sponsor of some of RIS's themes, and has made himself available to coordinate them; therefore, he participates in all the meetings. According to Alan, UNIOESTE has been proposing programs, projects, and edicts. He commented that, at the time, they were in the process of building an edict, in partnership with the Araucária Foundation and SEBRAE, through professor Reginaldo. Therefore, he analyzes UNIOESTE's participations as crucial in the innovation process. He pointed out that if there were more people from other UNIOESTE campuses involved, for example, the contributions would be greater.

About the role of UNIOESTE and its characteristics, Alan believes that it is fundamental that the university prepares and generates talents focused on technology, especially in the Engineering, Business Administration, and Economics courses, as they prioritize entrepreneurship somewhat more. He believes that the university could propose more projects, for example during academic weeks, that would totally open up opportunities for real problem-

solving and business, i.e., not just talking about making money, but also about social projects aimed at entrepreneurship. He complemented by saying that it could make more programs available to its scholars and professors as a way to stimulate them to participate in the market more intensely. This generates more partnerships with companies, integrating more and more to real problems and opportunities. He suggested that the end-of-course work should be done to solve a real problem in practice.

Alan points out that the main elements in the university's practices that impact the innovation ecosystem are critical thinking, talent generation, and openness to the market.

They were asked about the kinds of efforts UNIOESTE has made or is making to help create the innovation ecosystem, and the participant reported that it would be important to encourage and provide the participation of more professors and academics in innovation projects. He stressed again that the university should give more openness to social projects that stimulate entrepreneurship. As it happens at SEBRAE, he considered that the transformations become scalable and powerful. He said that the university needs to open itself up so that it can really assume a protagonist role in regional development and thus form people who are more qualified for the market.

When asking the participant about the way and when UNIOESTE planned and structured itself to act in the innovation ecosystem, the participant could not inform, because it is an internal matter for UNIOESTE.

Regarding university partnerships with companies, Alan said that there are formal and informal agreements. The formal partnerships are more time consuming and bureaucratic because they receive public resources, as the example of UNIHUB. As for the informal ones, SEBRAE, for example, proposes the performance of innovative actions with UNIOESTE academics, in which SEBRAE itself has resources and performs these actions at the university without the need to sign a contract. Another example of informal partnership is the dissemination of opportunities for scholarship holders to work on entrepreneurial innovations.

When asked on how UNIOESTE finances and monetizes its research and commercialization practices, Alan replied that he believes it is all through non-reimbursable project resources and scholarships, both from CNPQ, Fundação Araucária, and CAPES.

We tried to understand how UNIOESTE influences the development of new ventures in startups and the interviewee said he believes that the main point is the motivation of the professors to incorporate the culture of innovation and entrepreneurship. He reinforced that this is a good thing for the university and for society, and the other point is because it allows the

academics to participate in other programs, other Universities, and partnerships, such as the ones that SEBRAE has with UNIOESTE.

It was asked why the university decided to set up an innovation HUB and Alan answered that it was to strengthen the internal culture of innovation and to take a leading role in the ecosystem. Another objective was to provide teaching and learning for the academics, showing the importance of innovation in generating greater opportunities for the scholars, not to mention the space for knowledge and project development.

Regarding the ways UNIOESTE stimulates entrepreneurship in the community, both in the internal and external public, Alan reinforced that when projects are proposed, when its students and professors are allowed to participate, it stimulates the academics to participate in programs such as pre-incubation and incubation elsewhere.

When Alan was asked about UNIOESTE's management structure, whether he considers it flexible and easily accessible, and whether it minimizes bureaucracy in order to facilitate interaction between the actors of an innovation ecosystem, he answered that there are challenges because it is a public institution, just like SEBRAE. He said that although SEBRAE is private, it receives resources from the government, i.e., the process is similar. In this case, he believes that the university needs to pay attention to the agility of its processes. He believes that today it is easier because innovation is in the governor's speech, in the president's speech, in the minister's speech; therefore, everything now is innovation. The participant also cited examples of other institutions that have worked in partnership with companies for a long time, such as the Federal University of Minas Gerais (UFMG), in a small town "whose name he did not remember," which has a company installed there for over ten years. He also visited the city of Santa Rita do Sapucaí, which has an institute that is more than twenty years old, with several companies installed there, such as Huawei.

About the challenges and conditioning factors to be overcome by UNIOESTE in the development of this ecosystem, Alan firstly points out the issue of bureaucracy that impacts the realization of formal partnerships. The second challenge is the implementation of the culture of innovation in all the internal team at UNIOESTE and in the companies. And the third is to bring the students into the 'game', because they live in a complicated world, with many changes and social media, so it is increasingly difficult to attract the target audience, but he considered that UNIOESTE is in search of attractiveness.

Regarding the critical factors or barriers for the practices in the university/company cooperation process to be successful, Alan mainly considered the culture and openness of the university. He said that as a project manager there are situations that he observes with an

entrepreneur's eye and makes criticisms related to the university internally about its professionals in the following sense: "Sometimes it is more comfortable for me to stay where I am because I master it. "Even though I have a huge resume, have read several books, have done several trips, and have contact with several experts, I have mastered this area; I have lived this life." "My job and salary plan is focused on content production and qualification"; therefore, he considers that people prefer to stay in their comfort zones than face new challenges, having to get out of the theory to solve problems in practice. On the other hand, there is the market that often does not understand the university role and thinks that academia cannot help. However, he analyzes that there are many opportunities to be seized and accelerated on both sides.

When asked for some recommendations of other people who should be consulted as part of this study, Alan mentioned that, at SEBRAE, there is a colleague who has been following UNIOESTE for longer: Osvaldo César Brotto. He also mentioned the RIS coordinator, Jadson Siqueira, and believes it would be interesting to interview representatives from companies in the ecosystem such as the Cooperatives LAR, PRIMATO, and COOPAVEL (due to the time limitation for this work, it was not possible to interview these companies).

4.4 RELATIONSHIP BETWEEN THE CHALLENGES AND CONDITIONING FACTORS OF THE PERFORMANCE OF THE UNIVERSITY IN THE INNOVATION ECOSYSTEM

Based on the interviews conducted with the various players involved in the innovation ecosystem of the western Paraná region throughout this study, it was possible to relate the challenges and conditioning factors of the university's performance according to one of the specific objectives proposed in this study, more specifically, item 1.2.2 of section 1.2 of objective “c”.

Chart 8. List of challenges and conditioning factors

Actor	Challenges to be overcome	Critical Factors/Barriers	Facilitating Factors
NUPEACE – Maria da Piedade Araújo	the lack of institutional involvement.	There were no obstacles regarding the partnership with UNIMED.	they are easy and prompt.
TIC – Selmo José Bonato	the bureaucracy, the lack of human resources, the turnover between sectors, and the lack of public competitions.	UNIOESTE's lack of qualification and maturity in comparison to universities in other countries.	The initiative to seek partnerships with companies; public edicts and public funding.

PRAF - Dra. Nilza Maria de Souza Altavini	the cultural and organizational overcoming of the university and companies; making managers understand and stimulate the entrepreneurship culture.	the legal bureaucracy that leads to companies giving up on making partnerships, due to the delay.	UNIOESTE has people who facilitate innovation, taking the lead in the actions that provide the triggering of the processes.
UNIMED - Everton Antônio Garboça	UNIMED had to learn how to work with public entities, because it had to go through several internal processes such as FUNDEP approval; the participation in the edict and the issues related to documentation that are specific to UNIOESTE; the lack of flexibility and the COVID-19 pandemic.	the highly bureaucratic documental issue; the pandemic that prevented some satisfactory results in 2020; the academics' lack of experience in relation to the market, generating slowness in the development of the solutions demanded by the companies.	UNIOESTE received UNIMED openly, interested in the partnership; the availability and attention of some people that always contribute and help so that the processes happen and facilitate the communication between university/company.
Iguassu Valley – Ronan Medina	It is necessary to develop the internal culture, because it is believed that there has been a culture implanted over the years that the university cannot do external business.	the bureaucracy and once again the culture, because there is resistance when it comes to running programs on entrepreneurship, business, and partnerships with companies.	have been few; he believes that the biggest facilitator is FUNDEP for not having the same rules and bureaucracies that the university has.
RIS – Jadson Siqueira	The main issue has already been overcome: the prejudice, both on the business side and on the university side. Both did not see the importance of the university/company cooperation.	the mentality of some professors when Iguassu Valley helped to show what was being done in other ecosystems.	the existence of Iguassu Valley that promotes the connection with companies, universities, and other entities through weekly meetings.
SEBRAE – Alan Debus	the bureaucracy that impacts on the realization of partnerships; the implementation of the innovation culture to the whole UNIOESTE team and in the companies; bringing the students into the "game", because they live in a world of changes and social media, and it is increasingly difficult to attract the target audience.	the culture and openness of the university; there are many people at the university who want to stay in their comfort zone; and the market that often does not understand the role of the university and thinks that academia cannot help.	They were not mentioned by the interviewee.

Source: Prepared by the author (2021).

In relation to the challenges and critical factors to be overcome, bureaucracy and the internal cultural issue of the university stand out, since the delay and the excess of processes in the execution of a university/company partnership is perceived, often leading to the entrepreneurs giving up. In relation to culture, it is noted that the idea still prevails that the university is solely focused on generating education and graduation and does not get involved in practical issues arising from the market.

As for the facilitating factors for the university/company cooperation process, we highlight some professors who are proactive in seeking partnerships with companies and carrying out several actions that contribute to the development of entrepreneurship and innovation in our ecosystem.

Subsequently, the SWOT analysis of UNIOESTE was prepared based on the interviews, expressed in Chart 09. The analysis allows identifying the four quadrants involving the role of the university within the innovation ecosystem of Western Paraná, showing that the preparation of an action plan is of utmost importance in order to minimize its weaknesses and threats, and enhance its strengths and opportunities.

SWOT is an acronym for Strengths, Weaknesses, Opportunities, and Threats. It is quite a useful tool for making a strategic plan. This analysis allows identifying the strengths, weaknesses, opportunities, and threats of a company in order to contribute to the improvement of its performance, business competition, and project planning. This tool originated in the 1960s by Albert Humphrey, from Stanford University, and is widely used by all types of companies, because it enables choosing appropriate strategies to achieve their goals through critical analysis of internal and external environments (Serra, Torres, and Torres, 2004, p. 28).

Some points deserve emphasis in terms of its strengths, such as the partnership that the university has with influential entities within the innovation ecosystem, which contribute to the actions and the strengthening of the university/company cooperation. Other strengths that stand out are knowledge, skilled people production to work in the innovation area through its highly qualified technical staff, and the initiative of some professors, who actively participate in the movement Iguassu Valley and RIS.

Regarding the internal negative factors that were most observed by the interviewees, and according to the analyses performed, are the lack of organizational culture, the formalization of an institutional policy, and the lack of disclosure of actions taken by the university's departments, both for the internal and external society. Excessive bureaucracy was also observed in terms of time, which is very slow in resolving demands, often leading to desistance on the part of companies that make a certain partnership with the university.

Chart 9. SWOT analysis of UNIOESTE's role in the innovation ecosystem

	Positive Factors	**Negative Factors**
Internal Factors	**Strengths** - Partnership with influential entities that help the university/company cooperation (SEBRAE, FUNDETEC, FUNDEP, ACIC, RIS, Iguassu Valley, Companies, etc.); - Has a fundamental role within the ecosystem; - Partnership with some entrepreneurs who help with mentoring; - Approaching of the university to the large agro-industrial cooperatives in the region; - It has a highly qualified technical staff with masters and doctors; - Increase in the number of patents registered at the university; - It has technological projects for the highlighted agricultural area; - Realization of partnerships with other international universities; - Knowledge, Know-How, and production of skilled people to work in the area of innovation; - It has an innovation HUB to stimulate entrepreneurship; - It has some people with greater ease and more attentive to issues related to innovation and who take the lead to make the actions happen; - Several areas and sectors working in innovation and entrepreneurship (UNI, NUPEACE, NIT, Masters, PhDs, etc.);	**Weaknesses** - Few members of the university actively participating in the Iguassu Valley movement; - Lack of formal institutional policy at the University that encourages entrepreneurship and innovation; - Lack of recognition of the TIC in all campuses of the University regarding its role in the university; - Lack of standardization in the processes for the realization of university/company partnerships; - Bureaucracy formed by excessive delay in the resolution of demands and/or problems; - Lack of organizational culture; - Most people do not want to leave their comfort zone; in other words, they do not want to innovate; they do not want the university to open its doors to the market and become entrepreneurial; - Lack of human resources and turnover between sectors; - Idleness of staff in one department and overload of staff in other departments; - Lack of qualification and maturity in comparison to universities in other countries; - Lack of dissemination to society of the actions that are carried out; - Lack of identification of developed works, with potential for technology transfer and innovation. - Lack of interaction between departments that deal with innovation;

	Opportunities	Threats
External Factors	- Participation in the Iguassu Valley movement and RIS; - Increased formation of startups; - Some courses have the discipline of entrepreneurship and innovation in their syllabus; - Participation and collaboration in *hackathons* and other events focused on innovation; - Increase in the number of partnerships with companies with CAPES support in relation to the work of master's and doctoral students carried out in companies; Approximation of the university with the large agro-industrial cooperatives in the region; - Increase in the number of patent registrations, generating greater resources for the university - Restructuring of the Innovation Incentive Law; - Realization of partnerships with other national and international universities; - Creation of the Innovation Agency, encouraging the increase of startups; - Opening of public edicts; - Public financing; - Attracting foreigners to our region; - Unite academic theory with practice, training professionals capable of market solutions as well; - Pandemics (COVID-19); - Training professionals to meet the demand in the area of data science; - Significant positioning in national and international rankings; - Change in foundation laws.	- Legal bureaucracy; - Difficulties in registering patents in all the universities' TICs; - Academic evasion due to the lack of active methodologies; - Cultural issues that label the University in a negative way by society; - Lack of open public competitions; - Pandemics (COVID-19); - National and world economy; - Lack or reduction of budget passed on to the university;

Source: Prepared by the author (2021).

UNIOESTE's active participation in the Iguassu Valley movement and RIS stands out in relation to the opportunities, which can raise the university's level, making it a national and international reference by being one of the key players in the innovation ecosystem in the western region of Paraná, bringing it closer to the major market players. In terms of linking academic theory to practice, forming professionals capable of market solutions, a great paradigm that society, both internal and external, has in relation to the university will be broken. The pandemic can be taken as a neutral factor since it can act both in generating opportunities and threats to the university.

As for the threats, there is the bureaucracy issue again, but the legal one, which often impacts the realization of certain partnerships with companies, not allowing acting as the company needs and/or demands. The difficulty in registering patents and the budget reduction

are factors that can have a significant impact, since the university depends on these resources to continue advancing in the generation of new innovative technologies.

After the definition and in-depth analysis of UNIOESTE's current scenario, through the interviews and the analysis of the SWOT matrix, it was possible to start the proposal of a documented and formalized planning and monitoring instrument that allows the strengthening of its role in the innovation ecosystem in Western Paraná.

4.5 SUGGESTIONS FOR PRACTICAL ACTIONS THAT CONTRIBUTE TO THE STRENGTHENING OF THE UNIVERSITY WITHIN THE INNOVATION ECOSYSTEM

Finally, based on the systematic literature review and the interviews conducted in study, and after the SWOT analysis, proposals were elaborated for practical actions that contribute to the strengthening of the university's role within the innovation ecosystem in western Paraná. Therefore, the specific objective "d" and, thus, the general objective of the research are fulfilled.

First, it was possible to propose to UNIOESTE the strategies to be followed to reach the results of each defined objective. They are expressed in Chart 10 and are directed to the TIC and to NUPEACE concerning the responsibility to execute them.

Chart 10. Practical actions that contribute to the strengthening of UNIOESTE's role within the innovation ecosystem of Western Paraná

Proposed Actions
1) Seek partnerships with the industrial and agribusiness sectors and stimulate academics to develop projects in these areas (Etzkowitz, 2004);
2) Establish partnerships with the S systems for developing projects aimed at the industries in the region;
3) Create a communication channel through the university's website to disseminate actions related to entrepreneurial projects in order to update the internal and external communities;
4) Develop an organizational culture focused on innovation and entrepreneurship at the university through global strategic planning and after global unfolding by departments (Etzkowitz, 2013, Yousof and Jain, 2010);
5) Define institutional policies focused on entrepreneurship and innovation;
6) Create a group with professors, agents, and scholars that seeks to identify the innovative companies in Cascavel and region and then propose partnerships (not waiting for them to seek the university);
7) Create a dedicated strategic marketing team aimed at developing strategies for entrepreneurship and innovation, including the participation of academics in this team;

8) Develop events with computer science academics to stimulate their development in innovation and entrepreneurial systems, as well as in other ecosystems to generate more communication about the DATA LAB project;

9) Set a deadline for the completion of the UNIOESTE Innovation Agency project;

10) Segment projects within the university according to the proposed solutions;

11) Develop a project for the creation/participation in a technology park in order to approach large technological and innovative companies, with an innovative model to attract, develop, implement and integrate initiatives, provide differentiated, sustainable, and competitive positioning, and seek to unite the main economic segments of the region, such as: tourism, technology, environment, and specialized services. Thus, it will be able to generate innovation and sustainable development, designed to stimulate the innovative spirit and cooperation among the players. In addition, it should be able to unite ideas and knowledge, transforming them into new products and services, as well as large ecosystems in Brazil and the world, as mentioned by Zuti (2017);

12) Partner with other national and international innovation ecosystems to exchange organizations, researchers, and professors;

13) Encourage the participation of professors from all campuses of UNIOESTE in the ecosystem so that it is not only up to the initiative of a few individuals;

14) Develop an annual budget plan according to the real needs of the university, and from this plan, seek to reduce unnecessary expenses;

15) Seek fundraising in the external community through partnerships with large companies (Bizzi, 2018);

16) Create a global plan of accounts and by department and assign responsibility to a package manager both in the sector and in the global plan.

17) Dispose of fixed assets such as cars and carry out car rental planning. In this way, there will be a reduction in fleet and maintenance costs;

18) Adapt to the hybrid system of online classes and meetings, in order to avoid long trips and consequently generate savings for the university and for the students who live in other cities;

19) Increase scholars' incentive to participate in the weekly meetings of the Iguassu Valley movement, in order to awaken their interest in carrying out innovative and entrepreneurial projects;

20) Develop a Meetups project (Alfacon example) at the university;

21) Expand communication to all companies in Cascavel about the opportunity of CNPQ edicts that select master's and doctoral degrees in partnership with companies, so that master's and doctoral students can develop dissertations and theses aimed at solving real problems of a particular company;

22) Create requirements for course completion papers that lead to entrepreneurial and innovative development (Ravanello, 2017);

23) Direct undergraduate students to carry out projects that can be directly applied in companies according to their area of study, replacing the current TCC model;

24) Establish its own team to study market trends related to innovation and business, so that the university is always up to date, nationally and internationally, with what is being done in other ecosystems and which can be applied here;

25) Develop an information system that identifies and filters final papers according to each area that can be directed to the execution of projects in practice;

26) Make the academic weeks fully open to solving real market problems and social projects focused on entrepreneurship;

27) Set a final date to complete the execution of an institutional policy of innovation and entrepreneurship based on the federal innovation law, as it is necessary that the university has this institutional policy, to effectively enable its participation in the ecosystem;

28) Expand communication to all campuses of the university and inform the role played by the TIC, so that everyone has the knowledge and can direct their innovation projects to the proper sector;

29) Create indicators by sector that measure the actions of innovations and their results, and thus contribute to the innovation ecosystem;

30) Increase communication with companies to generate new partnerships in technology transfer;

31) Make the knowledge of this practice public with more emphasis on marketing to the internal and external communities of the university;

32) Seek partnerships with companies that can open up internship and trainee positions in technological areas. Thus, the scholars have the ability to execute their knowledge in practice;

33) Create a department or sector exclusively for mentoring, consulting, advising, and auditing, in order to provide greater support to small and medium enterprises in the city and region (Koste, 2010);

34) Develop its own sector of Advanced Business Incubation, creating a post-incubation environment, generating a condominium of companies, whose main benefit is the fostering of installation of industries and the generation of jobs and income in the municipality;

35) Propose a change in teaching methodologies; update in a more didactic way in order to lead academics into practice, especially within organizations;

36) Work the subjects in a project format so that students can work more on the development of a given situation;

37) Hold entrepreneurial competitions in certain courses in order to stimulate competitiveness, as occurs in the market;

38) Together with the other players in the ecosystem, establish and develop their processes, directing the role of each one involved in a clear and objective way to create a formalization;

39) Develop along with the ecosystem players the short-, medium-, and long-term strategic planning, establish its mission, vision, and values, and set goals;

40) Create standardized processes so that everyone involved knows how the correlated activities should be developed (Lemos, 2013);

41) Disseminate knowledge in the internal and external communities regarding the professional master's and doctoral degrees offered by the university. Show to this public that this modality is directed to solutions and business management, not only academic, because outside the university the only perception that one has of masters and doctorates is that they are useful only for "teaching";

42) Generate the appreciation of the academics within the university, making them feel proud to be part of the university. Demystify the negative view of society that scholars go to college just to get a diploma;

43) Develop a policy in search of resources with goals, deadlines, and responsible for a department of the university;

44) Perform benchmarking in Brazilian universities that have a large number of patents that earn them high royalties; identify best practices for application in UNIOESTE and increase opportunities for the university (Sousa, 2018);

45) Hold meetings with TICs from other universities to seek the root cause of the problem that leads to the difficulties in registering patents and search for a solution through a solution development plan;

46) Create a coworking so that entrepreneurs can rent, per hour or monthly, rooms to carry out their work;

47) Conduct visits to major technology companies in Cascavel and region for generating partnerships;

48) Disseminate knowledge to the academics about what a Startup is and then encourage them through involvement in various projects that must be devised together with teachers of each area of education, generating a competition through the formation of teams;

49) Encourage the creation of Junior Enterprises, not only in the areas of Applied Social Sciences, but in all areas, in a gamified way, thus generating a competition among teams;

50) Hold at least two *hackathons* a year, one per semester, in different areas;

51) Encourage academics from all university courses to use the innovation HUB, encourage the participation of academics in *hackathons*, and involve the most diverse companies and areas;

52) Promote campaigns to encourage the realization of new products and services, as well as mentoring entrepreneurs and academics;

53) Hold lectures on entrepreneurship and innovation, open to the public;

54) Hold lectures inside companies;

55) Hold courses on entrepreneurship and innovation;

56) Launch an entrepreneurial marathon;

57) Open graduate courses focused on technology transfer, innovation, and business;

58) Segment the audience of companies according to the undergraduate courses offered by the university in order to form *hackathon* teams according to each market branch, for example: engineering, health, and others;

59) Include the discipline of entrepreneurship and innovation in all the university courses;

60) Increase the number of participations in technology and innovation fairs, stipulate an annual calendar, and include it in the university annual budget;

61) Develop standardized processes for each department according to their activities, so as to make them more agile and give the necessary autonomy for decision making (Urbano & Salamzadeh, 2014);

62) Stipulate shorter deadlines for returns from each process, in order to generate greater agility in resolving demands;

63) Conduct training and mentoring to the teams of each department, create the spirit of "owner" as well as a company, in order to develop the business culture and concern about good customer service;

64) Propose flexibility and improvements in the innovation laws to the governors, contribute to the debureaucratization of processes and thus facilitate the partnership between universities and companies (Smorodinskaya et al., 2017);

65) Define the role of each UNIOESTE department and make it public to the entire academic community;

66) Conduct training on the processes to those involved in each department;

67) Develop annual strategic planning for each department;

68) Establish goals and indicators by department (Kirby, 2006);

69) Direct the activities to the agents and/or teachers according to their functions described in the announcement of the Selection Process and or Public Tender, and alert them about their responsibilities and obligations;

70) Train the managers of each area in leadership and attendance; management processes, and strategies according to SEBRAE (2018);

71) Perform a business diagnosis in each department of the University, in order to identify overwork for some employees and idleness for others per department. After this diagnosis, develop a team relocation plan to provide balance in the activities and generate agility in the processes;

72) If necessary, open new vacancies to hire new agents and/or teachers via a competitive examination or selection process;

73) Initiate a campaign to encourage companies in the region to generate an innovative culture in the business environment (Achaeffer, Ruffoni and Puffal, 2015);

74) The University, through its managers, should encourage teachers and agents to keep constant qualification, so that they are always updated, especially about what is happening in the market and in other universities (Laimer, 2013);

75) Make an annual training plan per department and include it in the annual budget plan;

76) Carry out an Individual Development Plan for its agents and professors so that they can contribute to constant innovation at the university and in the ecosystem;

77) Increase the participation of agents and professors in the technical chambers that take place at ACIC according to each area. For example, education chamber, tourism chamber, entrepreneurship chamber focused on women; engineering chamber, agribusiness chamber, and others.

Source: Prepared by the author (2021).

Subsequently, it is suggested the use of management tools that are used to control the results obtained with the processes adopted on a daily basis. They provide information that can directly influence the organizational growth methods. In this context, the use of the 5W2H tool is suggested for the application of the proposed actions. The 5W2H originated in the Japanese automobile industry and aims to assist during the corporate planning phase (Silva, Roratto, Servat, Dorneles, 2013).

For Meira (2003), the 5W2H is an excellent tool to put action plans into practice as from a set of seven questions capable of clearly defining the activities developed in the process desired to be improved in a quick and efficient manner, coming from the English words: What - what must be done? Why - why does it need to be done? Who - who should do it? Where - where will it be implemented? When - when should it be done? How - how will it be conducted? How much - how much will this project cost? Therefore, this is the meaning of the name 5W2H.

By answering the questions realistically, it is possible to clearly identify the needs of an organization and or project to then formulate a plan and achieve its goals, controlling time and reducing waste (Fundação Instituto de Administração - FIA, 2020). For Lenzi, Kiesel and Zucco (2010), the tool provides clarification for the proper execution of the proposed plan and the activities that should be developed by each person responsible according to the objective to be achieved. Figure 15 shows the 5W2H tool model.

5W					2H	
What	**Why**	**Who**	**Where**	**When**	**How**	**How much**
Action Problem Challenge	Justification Explanation Reason	Responsible	Site	Deadline Timeline	Procedures Steps	Costs Disbursements

Figure 15. Sample Action Plan Tool - 5W2W Methodology

Source: Adapted from SEBRAE (s.d).

For a continuous improvement of all processes, we suggest the use of the PDCA methodology, whose acronyms come from the English language, referenced in the four management steps: Plan; Do; Check; and Act. It is also known as Shewhart Cycle, Quality Cycle, or Deming Cycle. It aims to diagnose and analyze organizational problems. It is extremely useful for solving problems and conducting systematic actions that speed up the achievement of better results with the purpose of guaranteeing the survival and growth of organizations (Quinquiolo, 2002). An example of the cycle can be seen in Figure 16.

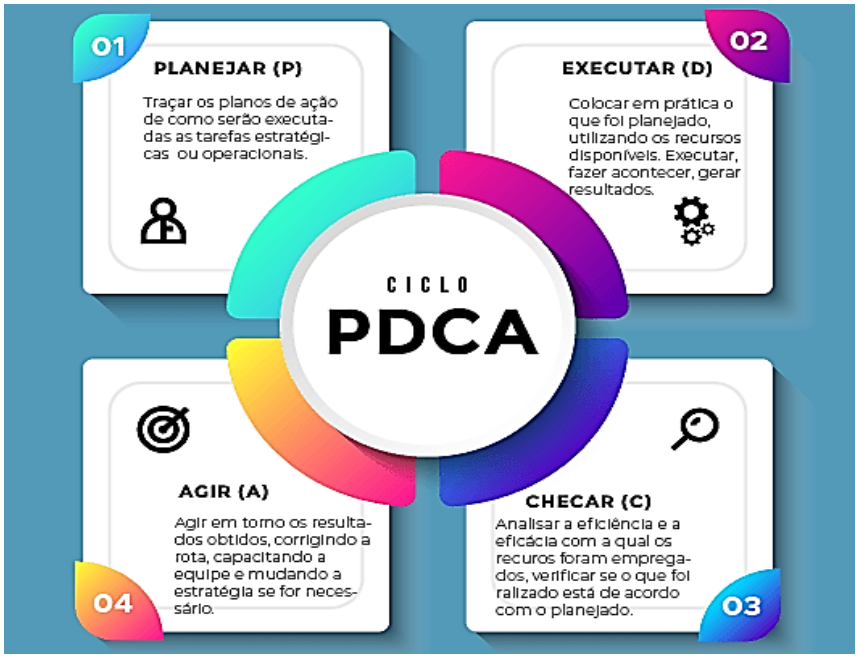

Figure 16. Tool for continuous improvement - PDCA cycle

Source: Adapted from Amaral (2019).

Among the benefits related to the PDCA methodology use, the following stand out: simplification of process management, its application does not require extensive knowledge of management theories or tools; focus on quality to generate results that increase the value of products and services of the organizations; increased control over the activities; provision of constant learning; and team engagement and motivation, showing that each one has its role in the search for continuous improvement. By prioritizing continuous improvement, the PDCA raises the competitiveness of companies, provides testing, validation, or denial of solutions to different problems, allows early identification and even prevention of large and small deviations thanks to frequent monitoring, reduces costs with human, material, and financial resources, decreases the time and energy dedicated to respond to a demand, and is versatile, as it can be applied in any department or sector, such as industry, commerce, or services. PDCA is capable of generating changes, as well as propitiating innovation and competitiveness in organizations (Fia, 2020).

The tool follows the logic that it is necessary to maintain control over processes in order to avoid deviations. To this end, it uses four steps that form a cycle, which are repeated in the same order. The first step begins with good planning, establishing goals and the method to be used, that is, the route that will be used to reach the goal. Skipping this step can cause waste of time, money, unproductive tasks, and lack of focus. Next, it is time to put the plan into action,

that is, it is time to 'do'. It is crucial that the team that will be part of the plan is trained for its best execution. The third step is to check, that is, to verify the functioning of the plan and analyze the effectiveness of its activities. As a form of evaluation, we suggest the implementation of indicators to have references. This way, it is possible to evaluate the actions that generated satisfactory results, and which can be incorporated into the process, while the flaws should be corrected in the following step. Finally, the last stage of the cycle consists of decision making. If the result is positive, it means that the objectives (goal) have been achieved and thus it will be possible to adopt the process as a reference in the organization. Otherwise, the planning and execution should be re-evaluated to identify its flaws in order to find its root cause, and thus the cycle continues, as many times as necessary (Fia, 2020).

As the PDCA cycle is directly linked to processes, it is of utmost importance that all stakeholders obtain a deep knowledge in the identification of the inputs, customers, and the outputs they acquire, also considering the organization's internal relationships (Tachizawa & Scaico, 2000), i.e., the view of internal suppliers, in this case, adapted to the university's view.

5 CONTRIBUTIONS TO PRACTICE

This study demonstrated the importance of the roles played by universities within innovation ecosystems, especially the role played by UNIOESTE, object of this study. This importance goes beyond the formation of intellectual capital, since it is clear that, behind every innovation ecosystem, there is a university engaged with actions aimed at the development of a region, which trains people with the ability to develop innovative ideas and to absorb the available technology more easily.

As from the research presented in the theoretical framework and the interviews analyzed, the study showed the importance of constituting innovation ecosystems that promote the growth and development of organizations and of the region where they were formed, in a faster, and more collaborative and innovative manner. Thus, satisfactory results and competitive advantages are generated for all those involved, stimulating entrepreneurship and knowledge exchange. In this context, the study evidenced the practices performed by universities, highlighting UNIOESTE, as a way to provide the economic, social, and cultural developments of the region and the organizations.

The practical contribution of this study is in pointing out UNIOESTE's role to all the other actors involved in the ecosystem of the Western Paraná region, the internal and external academic community, companies, public and private entities, and the government. This role is essential for qualifying entrepreneurs able to start projects and innovative solutions that contribute to leveraging their businesses and solving problems through partnerships between university and companies, and that develop an entire region economically, socially, and environmentally.

Another extremely relevant factor contributed by the university is the creation and development of graduate courses at the master's and doctoral levels that enable the formation of a highly qualified technical staff. Thus, the best professors and researchers are obtained, considering that this makes all the difference when embracing an innovative project arising from scientific and technological research.

The study also showed that the university can generate an entrepreneurial culture in the internal and external communities, as well as develop people's way of thinking, in terms of how to solve problems, and how to undertake and generate business. Entrepreneurial solutions are also noticed with the undergraduate and graduate courses and the inclusion of entrepreneurship

in their curricula. It was also possible to verify several external projects that are performed by its agents, professors and researchers and stimulate the generation of resources for UNIOESTE.

The research also contributed by showing that UNIOESTE still has much potential to develop in entrepreneurial practices aimed at the internal and external communities, as there are actions that are not fully explored. Thus, it can be seen that the lack of a formalized institutional policy limits, in some way, the university in carrying out more actions and partnerships with companies. Bureaucracy is also a limiting and evidenced factor, and the stimulus to new startups and patent registrations could also be properly explored. Another factor to be cited is that the communication of actions developed by the university to the external public could be more evident. Furthermore, the research showed that the university has a greater potential of professionals who could be engaged with the innovation ecosystem; however, for convenience, they do not participate. Therefore, initiative and pro-activity are under the practice of a small portion of professionals who undertake this commitment.

The theoretical contribution of this research occurred from the survey of studies of innovation ecosystems in Brazil and worldwide and the role played by universities. This research also contributed to the replication of processes and actions in the innovation ecosystem of the region and in UNIOESTE. There was an attempt to gather recent ecosystem works in partnership with universities that could inspire ideas of innovative projects for the ecosystem.

We also contributed with some suggestions for possible solutions and improvements to key points regarding the role played by UNIOESTE in the innovation ecosystem in the Western Paraná region.

Finally, it can be said that this study contributed to the university managers, as they can verify where they need to improve and contribute to the development of the region. The same can be observed for public agencies and other actors involved in the innovation ecosystem, since they can verify the points where they should strengthen their actions. This research also contributes to researchers, as it unites several studies on innovation ecosystems and universities. In this work, the specific results of the innovation ecosystem of the Western Paraná region are also found, since the research is focused on the role played by UNIOESTE within the ecosystem of the Western region of Paraná, as well as on the development of actions adapted to the reality of the researched public in order to measure the region's development.

It is also hoped that the research can be used as a support for the application of other studies within the region's innovation ecosystem, and that researchers can use it to improve possible discovered gaps.

6 FINAL CONSIDERATIONS

It is considered that this research has reached the proposed objectives, since the general objective was to understand the role played by the State University of Western Paraná within the Innovation Ecosystem in the Western Paraná region. The specific objectives of this work were met, since it is possible to verify in Chapter 4 that the innovation ecosystem of the Western Paraná region and its relations with the actors and their roles involved in these practices were described. The entrepreneurial practices of UNIOESTE, related to the development of the ecosystem, were also identified. Still in chapter 4, it was possible to relate the challenges and conditioning factors of the University's performance in the innovation ecosystem and finally suggest practical actions that contribute to the strengthening of UNIOESTE's role within the innovation ecosystem in the Western Paraná region.

In the role played by UNIOESTE within the Innovation Ecosystem of the Western Paraná region, projects and actions focused on innovation and entrepreneurship that contribute to the strengthening of the entire region were evidenced. Only a few professors and agents have made an effort and actively participated in the movements of the ecosystem, in order to turn UNIOESTE into an Entrepreneurial University. They demonstrated to the whole community, how crucial is the university role within an innovation ecosystem, an importance also given by the other actors interviewed. However, it was observed that the interviewees, in general, demonstrated to be aware of the points to be improved in the role played by the university. It is worth considering that UNIOESTE has a great potential both in participating and developing the ecosystem; however, this potential is little explored due to cultural issues, lack of institutional policy and excessive bureaucracy that impact the realization of partnerships between the university and companies.

A series of practical actions were suggested that can contribute to the strengthening of the role played by the university within the innovation ecosystem in the western region of Paraná, as shown in Chart 10. It is also recommended that the university's top management intervene with the government on the issue of making the innovation law more flexible so that it can contribute to the debureaucratization of the processes in favor of the partnership between universities and companies, in order to achieve satisfactory results for the entire region.

The problem situation focused on UNIOESTE's readiness to obtain scientific, technical, structural, economic, and regulatory capabilities to generate innovation. Thus, the role played by the university within the innovation ecosystem in the Western Paraná region was verified,

in order to create solutions to problems and to meet the social needs of the region. The goals are to enhance the culture, habits, values, history, and specificity of the place, according to its characteristics, as well as to contribute to regional technological advances, as can be seen in the results of the interviews with the various players involved in this research.

In relation to the limitations of this research, we highlight that it was not possible to interview all the players involved in the region's innovation ecosystem, due to the incompatibility of agendas and their lack of interest.

Studies that can contribute to the role played by universities within innovation ecosystems are recommended. Considering the critical results analyzed in this research for internal cultural issues at UNIOESTE, an organizational climate survey is suggested with questions that lead to the understanding of the real reason why most of its professors and agents remain in their "comfort zones" and do not contribute proactively to the entrepreneurship of the university. After the analysis of this study, a development plan for the university' s employees is suggested, leading them to become aware of the importance of entrepreneurship and innovation of the university itself. In continuation of this proposed study, the application of the same study in other universities is suggested so as to compare them. For internal bureaucratic issues, an in-depth diagnosis by university sector is suggested in order to understand the processes and their possible bottlenecks, thus suggesting the restructuring of these processes that lead to agility in the solution of problems and or demands.

We also suggest for future studies the continuation of this research with other actors involved in the innovation ecosystem in the western region of Paraná, since it was not possible to interview them due to agenda incompatibility and lack of interest. Therefore, a larger panorama was obtained regarding the conception of these actors in relation to the role played by UNIOESTE in the ecosystem.

Furthermore, the follow-up of new actions performed by UNIOESTE is recommended, in order to analyze the application of the suggestions proposed in this dissertation and the results obtained. We also indicate the application in other universities with the same size since this research allows for comparisons.

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APPENDIX A – RESEARCH INTERVIEW SCRIPT

RESEARCHER: Cathia Petranski Corrêa

ADVISOR: Sandra Mara Stocker Lago Date: _____/_____/_____

This study aims to analyze the role played by the State University of Western Paraná within the Innovation Ecosystem of the Western region of Paraná.

A) PARTICIPANT DATA

1) Name of the agent involved (Company/Institution)
2) Name of the participant
3) Position/Function
4) Area involved in the cooperation

B) INTERNAL AND EXTERNAL PRACTICES RELATED TO THE ECOSYSTEM

5) U-E cooperation has increased in recent years, developing a business-oriented ecosystem related to the innovation and technology around it. Can you tell me how this process is unfolding?

a) Objectives that led to the partnership;
b) Whose initiative it was;
c) Who the agents involved were;
d) There was commitment in the negotiation phase for the partnership;
e) The objectives are being achieved with the U-E cooperation.

6) Could you tell me in detail, what the main milestones of this process are in our region?
7) How were decisions made and what was the structure of the Innovation Ecosystem in the region? Who participated in this process?
8) How is the involvement between the participants in this innovation ecosystem?
9) How would you describe the role of UNIOESTE? What characteristics of the university do you highlight in this context?
10) What would be the main elements present in the university practices that impact the innovation ecosystem?

What types of efforts do you understand UNIOESTE has done/does to help create the innovation ecosystem?

11) How and when did UNIOESTE plan and structure itself to act in the innovation ecosystem?
12) How do partnerships occur between the university and companies?
13) How does UNIOESTE finance and monetize its research? Is there any commercialization practice? What is it?
14) How does UNIOESTE influence the development of new enterprises and startups?
15) Why did the university decide to set up an Innovation HUB?
16) How does UNIOESTE stimulate entrepreneurship in the community (internal and external public)?
17) In your opinion, do you think that UNIOESTE has a flexible and easily accessible management structure, minimizing bureaucracy, in order to facilitate the interaction between the actors of an Innovation Ecosystem?

C) CHALLENGES AND CONDITIONING FACTORS

18) In your opinion, what were the main challenges to be overcome by UNIOESTE in developing this ecosystem?
19) And what were the critical factors/barriers to successful practices in the U-E cooperation process?
20) Were there any facilitating factors for the U-E cooperation process?
21) Is there anything else that you think I should know to better understand the role of UNIOESTE within the Innovation Ecosystem of the region?
22) Could you recommend me other people that you think should be consulted as part of this study?