PRODUCT
Management & Development
An International Journal for Transdisciplinary Research in Innovation

ISSN 2237-5228

Journal homepage
www.pmd.igdp.org.br

Research Article

Collaborative vision to create an innovation habitat model

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Abstract

The universities are transforming to include entrepreneurship in researchers' training, which has motivated the concept of an entrepreneurial university. To be connected with innovation networks is a mandatory characteristic of these institutions. The biotech sector is an example. Excellence in research requires a multitude of competencies more present for those universities immersed in Innovation Habitat. But how initiated an innovation habitat in this area? This research describes an experience where vision was applied to create an innovation habitat and foster academic entrepreneurship by guiding technological entrepreneurship initiatives among undergraduate and graduate students, researchers, and professors. Aside from its contribution to the field of entrepreneurial university theory, the study proposes vision as a useful tool for developing an innovation habitat.

Keywords: entrepreneurship, entrepreneurial university, innovation habitat.

1. Introduction

Entrepreneurship is one way to drive a society's progress and is an important mechanism for economic growth. It promotes innovation, increases productivity, creates new jobs, and can help address society's challenges, such as sustainable development, poverty relief, and social inequality. For these reasons, several governments have begun implementing policy frameworks and programs that promote entrepreneurship.

The Global Entrepreneurship Monitor (GEM) began in 1999 as the result of a partnership between Babson College and the London Business School. It conducts research on the role of entrepreneurship in the social and economic development of nations and is currently one of the most comprehensive annual surveys of entrepreneurial activity in the world. GEM has monitored entrepreneurship both in terms of the state of the entrepreneurial mindset, motivations, activities, and ambition and in terms of the structural conditions that countries need to facilitate the practice of entrepreneurship in an economy (Bosma et al., 2020).

Since the late 1990s, technological entrepreneurship has been recognized as a major issue for Brazil in the policies of higher education institutions and in support or incentive programs created within universities to incorporate and offer these activities. Costa & Torkomian (2008) report that initiatives to create academic spinoffs in Brazil are concentrated in the southeastern (60%) and southern (24%) regions. The University of São Paulo (*Universidade de São Paulo* - USP), University of Campinas (*Universidade de Campinas* - UNICAMP), and the Federal University of Santa Catarina (*Universidade Federal de Santa Catarina* - UFSC) have the most initiatives.

This is a new, crucial mission for modern universities (Muniz & Pereira, 2005); it is the result of a change process that began in the last century and has been designated the entrepreneurial university (Etzkowitz, 1997). In addition to teaching and producing research, entrepreneurial universities also aim to generate new businesses, including spinoffs and research results (Muniz & Pereira, 2005).

Ghesti et al. (2018) describe an example of innovative technology developed at the University of Brasilia, where postgraduate students and entrepreneurs created a startup Macrofren - Chemical Technology. The case shows the importance of the university for the development of innovation habitats, which consolidate the university-industry partnership. The idea of an entrepreneurial university highlights the strategic role that research laboratories and centers play in their ability to create and disseminate knowledge, thereby enhancing the innovative capacity of the university's region (Ndonzuau et al., 2002).

Received: December 7, 2021. Accepted: August 9, 2022.
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Oliveira (2015) proposes a model to stimulate creation of academic spinoffs based on an entrepreneurial ecosystem. The model describes the internal and external elements of a university that make up an entrepreneurial ecosystem but does not detail the actions that need to be executed or how to structure a business process.

One of the challenges in promoting technological entrepreneurship lies in identifying and disseminating models, methods, and techniques that allow creating support structures and organizations within universities that are capable of efficient entrepreneurial training processes and thereby stimulate the generation of academic spinoffs.

This challenge is especially important in Brazil for the area of biotechnology, given its potential for innovation. There are many experiences where actions are driven by innovation in offices, tools, and methods for new product development. However, so far, no solutions exist for initiating this process by attracting stakeholders to a habitat near a university that aims to strengthen the ecosystem and move toward an entrepreneurial university connected to an innovation ecosystem. According to Walrave et al. (2018), this involves creating a value proposition for the habitat. How does one initiate this process and develop this proposition? Would it be possible to apply vision to form an alignment between the potential partners that one wants to attract to an innovation habitat model?

This paper explores a proposal for collaboratively creating a vision for an innovation habitat model for academic entrepreneurship. It describes an experience of applying vision to create an innovation habitat model by aligning various stakeholders in the process, including undergraduate and graduate students, researchers, professors, the institution, and businesses.

2. The entrepreneurial process in Brazil

Bosma et al. (2020) and GEM organizers presented a study on the proportion of adults who start new businesses with technologies or procedures that are new in their area, country, or the world. The results for Brazil relative to this indicator reveal that initiatives focus on new area businesses.

According to the study, offering good environmental conditions can help sustain a new venture in an established business, while difficult conditions can facilitate business closures and creation of new ventures. Switzerland is classified as the strongest country in terms of this indicator of how easy it is to start and develop a business, followed closely by the Netherlands and Qatar. The lowest scores for this indicator belong to Iran, Puerto Rico, and Paraguay (Bosma et al., 2020).

Factors that negatively impact entrepreneurship in Brazil include low economic growth and political turmoil. In 2019, important measures were implemented that should facilitate entrepreneurial initiatives in Brazil. Examples include the labor reform projects that have been in effect since November 2017, which allow more flexibility in labor contracts, and the Provisional Presidential Decree for Economic Liberty (*Medida Provisória de Liberdade Econômica*), which contemplates policies such as terminating license requirements for low-risk small business activities and simplifying the national digital system for tax collection and social security obligations (Bosma et al., 2020).

In the financial sphere, the Simple Credit Company (*Empresa Simples de Crédito* – ESC) law (Brasil, 2019) is intended to increase access to funding for micro and small businesses and individual micro entrepreneurs (*Microempreendedors Individual* - MEIs) and to formalize the microfinance system. Another financial incentive program created by the government is the National Program to Support Micro and Small Businesses (*Programa Nacional de Apoio às Microempresas e Empresas de Pequeno Porte* - Pronampe) (Brasil, 2021b). Created as an emergency measure during the 2020 pandemic, this initiative became a permanent program; it provides credit to small businesses and appealing interest rates based on the SELIC rate, plus a ceiling of 6% per year.

The Legal Framework for Startups enacted by the Supplementary Law 182/2021 (Brasil, 2021a) should be a new vector of economic, social, and environmental development and establishes regulations for innovative entrepreneurship. An important change provided in the Legal Framework for Startups relates to framing companies as startups. The need to consider startups as a separate business category allows for creation of specific legislation without compromising other businesses in the economy. Another change set forth in the Legal Framework for Startups relates to new tax rules that will reduce costs and give these enterprises a better chance to survive the startup valley of death until they attain financial consolidation for growth.

3. Entrepreneurial university

Universities must evaluate their role in society's socioeconomic development. As evolving systems, universities have adapted to three main approaches: specialization, diversification, and hybridization. Specialization refers to a focus on education, while diversification emerged more recently when universities

broadened their scope by including research as a basic function. The hybrid model integrates the different functions established during the diversification process (Rodrigues & Tontini, 1997).

A university is as entrepreneurial and complete as its degree of technical and scientific expertise and its capacity to transmit knowledge to society. Understanding knowledge as capital and the emergence of an "entrepreneurial university" are ongoing processes worldwide, including in Brazil (Araújo et al., 2005). Thus, the ability to adapt to this new model by absorbing, learning, and encouraging entrepreneurship will be fundamental for universities in the coming decades.

Entrepreneurial universities must be incorporated into favorable ecosystems and even develop innovation habitats that establish all the conditions necessary for innovation opportunities to thrive. According to RUE (*Ranking de Universidade Empreendedora* - Entrepreneurial University Ranking), an indicator proposed by the *Brasil Júnior* movement, the state of São Paulo has four universities in the top ten, with the USP ranking first in 2019 (Brasil Júnior, 2019).

3.1. Innovation habitats

Creating environments that encourage the exchange of knowledge toward innovative goals through partnerships between universities, businesses, and government is imperative in the context of large volumes of information and new technologies. The physical places where such exchanges occur are called "innovation habitats" (Machado & Pereira, 2019).

Innovation habitats characterize a triple helix environment of integration. They are environments that offer stimuli for entrepreneurial development throughout all phases of the process, from the birth of an idea to the consolidation of a company with a focus on technology and innovation. Entrepreneurs seek these environments to cooperate with universities and research centers by sharing knowledge and innovations (Silva et al., 2019).

Innovation habitats are learning spaces shared with various actors (businesses, universities, government) where diffusion of tacit knowledge is intensified. There is greater incentive for interactions between businesses to establish partnerships. Interactions between research institutions and government agents for conducting research can be transferred to the productive sector and contribute to the economic development of a city, region, and country (Correia & Gomes, 2010).

Coexistence is the first step toward cooperation, a principle recognized since the groundbreaking work of Lee et al. (2004), who demonstrated that the creation of new companies in a given region is associated with indicators of creativity, diversity, human capital, and population growth, among others. This explains how a city or place with a concentration of these factors can promote entrepreneurship.

However, what can be said about promoting the creation of an innovation habitat like this when there are potential partners who are not integrated? Baum et al. (2000) noted that the ability of startups to establish alliances directly impacts their performance during the early stages of development. This is related to an appropriate configuration of the network of partners, complementary competencies, and the ability to form an alignment between rivals to promote a low-risk environment.

Through a broad review of the literature on ecosystems, Walrave et al. (2018) tested propositions about the path for creating and strengthening these complex stakeholder networks. Among them, the authors state that an ecosystem's value proposition needs to be established and aligned with an ecosystem model.

The findings of Baum et al. (2000) and Walrave et al. (2018) suggest that the first step toward establishing innovation habitats would be to bring the actors involved together and promote alignment between their value propositions to maximize the complementarity of their competencies and minimize the risk between rivals.

3.2. The use of vision to design the innovation habitat model

From Adner's (2017) perspective, the formation of an innovation ecosystem environment is essentially defined by a multilateral alignment among partners, which allows them to interact and generate a value proposition that can materialize. In the literature on operations management, the "vision" construct is closely related to this alignment and provides insight into this formation. The vision construct was first introduced in studies on strategy and project teams. In operations management, "vision" is used in the areas of design management, project management, and new product development processes (Benassi et al., 2016).

In the areas of new product development processes, the vision of the product can be considered a purpose to be shared, an expectation about something that will be realized in the future, and a way of anticipating the result of the project, which instigates the preparation and care of the areas involved, indicating what must be built and not a forecast (Parikh & Neubauer, 1993, Smith, 2007). According to Chen et al. (2010), the product vision is a statement of goals to develop new products and ensure compliance with the schedule. The product vision is a visual artefact (image) that can represent an interface between the project team and the customers. The product vision is capable of making communication clear, succinct and intelligible (Lange & Hehl-Lange, 2010).

Therefore, product vision is defined as a set of artifacts that describe the expected result of a project through visual and textual elements, which are prepared in a concise and collaborative manner. These elements are in alignment with the strategy that the project should follow and are capable of challenging the team to meet the result (Benassi et al., 2016). There are several methods for creating a vision for a team. For a better understanding of this artifact, see the examples provided by Hekkert & van Dijk (2001, 2011).

A visual model can be used to represent a product's vision. This visual model has the advantage of being the simplest means of describing the product, which mainly considers the requirements of the product, generality, and reusability, but without great detail. Benassi et al. (2011a) cite some models for the construction of vision, such as: Future Workshops, Vision in Product Design Approach, Visionary Concepts, Vision-Oriented Innovative, Product Vision Management Method (PVMM).

Could this artifact be used as a tool to develop a value proposition, as advocated by Adner (2017)? Could it be a useful instrument for consolidating an innovation ecosystem? Thus, it seems possible to “appropriate” the vision construct as a graphic representation to describe an expected innovation habitat that facilitates and/or fosters collaboration and alignment among stakeholders to generate an ecosystem’s value proposition.

4. Metodologia

This article addresses the application of the product vision concept for the idealization of innovation habitat model, which is favorable for partnerships and innovation development in the academic environment. We sought to define a research strategy that involved researchers, professors, managers of the higher education institution and potential partner companies. The mapping of the competencies of researchers at the institution where the habitat will be located was a relevant source of information, in addition to meetings with the institution's managers to identify the strategic requirements and targeted meetings with groups of potential partners in the business sector. The PVMM product vision model, proposed by Benassi (2009), was used as a methodological reference for building the vision of the innovation habitat, illustrated in Figure 1.

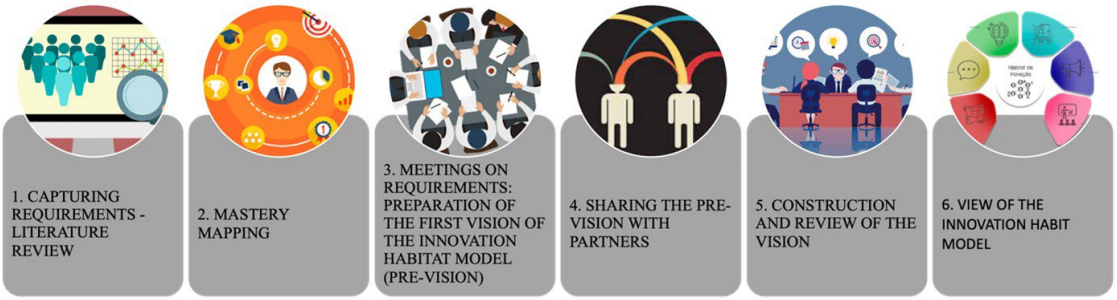

Figure 1. Steps to Vision development. Source: Prepared by the authors.

The research describes the steps to create a participatory vision of habitat innovation in the biotechnology area to contribute to the consolidation of the actors of the entrepreneurial university. In general, the research steps are described below:

1. Review of the literature. The first stage of the work consisted of a review of the broad literature, which involved topics are not detail in this article, such as governance of innovation centers, innovation habitats and technological innovation centers, open innovation in universities;
2. Choice of case. The case study refers to the constitution of an innovation habitat in a postgraduate program in biotechnology at a private university in the interior of São Paulo, Brazil. The postgraduate program there is for six years developing works associated with regenerative medicine and medicinal chemistry, with potential for innovations. This fact motivated the creation of an innovation habitat;
3. Mapping of competencies of the postgraduate program's body of researchers. Ten researchers described their main projects and keywords. Based on the results, five meetings were held with groups of researchers, according to their availability, to align the group's competencies;
4. Discussions of strategies to identify partners. The mapping of the group's competencies was the first source of information for elaboration first vision of the innovation habitat model, with which it would be possible to share the model with other actors in the habitat: potential business partners. In this stage, were contacted potential business partners through the researchers' contact network;
5. Meetings with business partners. Two meetings were held with some stakeholders to identify potential partnerships and a mechanism for bringing them closer. In this stage, the researchers presented the previously

elaborated vision of the innovation habitat model to stakeholders. The contact with the companies seeks to demonstrate its structure favorable to the partnership;

6. Proposal of the innovation habitat model. From the researchers' reflections on the results of the meetings with business partners, which highlighted the importance of compliance and the need for transparency in contractual relationships to establish trust between the parties, the vision of a habitat model emerged. In this process were elaborated three models. In each proposal, we sought to: identify the actors involved; b) the tools to be used in the innovation process; c) the chaining of activities; and d) the performance criteria;
7. Presentation of the innovation habitat model. The researchers shared the innovation habitat model with the coordinator of the postgraduate program in Biotechnology.

5. Results

Following the strategy to consolidate itself as an entrepreneurial university, the graduate program in this study was established as a consolidation project; one of its objectives is to constitute an innovation habitat conducive to developing innovations in applied research in biotechnology, medicine, and health. Thus, the center seeks to provide an attractive environment for industries in that sector and promote interaction between professors, researchers, undergraduate and graduate students, and other research centers and enterprises to execute innovative projects.

The first stage in preparing the innovation habitat's vision involved meetings with the graduate program coordinator that focused on the concept of an entrepreneurial university, illustrated in Figure 2. These first interviews revealed some initial directions that the leaders expected and the first outlines of an innovation policy and Technological Innovation Nucleus (TIN) to foster tacit knowledge and further disseminate the culture of innovation among the academic community.

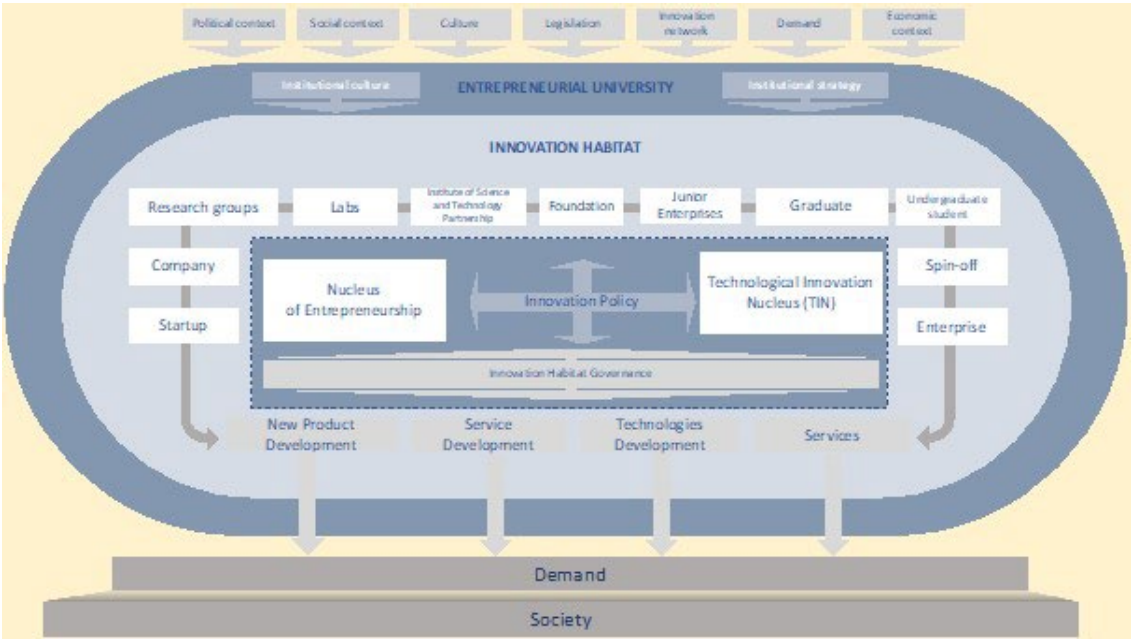

Figure 2. Entrepreneurial University Vision. Source: Prepared by the authors.

The innovation habitat model is inserted in the context of the entrepreneurial university, which has external influences: legislation, demand, economic context, political context, and social and cultural context, which strategies factors for the university. In the view presented in Figure 2, the innovation habitat has as central elements the Technological Innovation Nucleus and the Entrepreneurship Nucleus, both governed by the institution's innovation policy. The other actors aligned around these elements, which develop research, collaboration and service projects, following a model of innovation development, in response to the demands of society. The model can be established work in partnership with companies, research groups, the Institutes of Science and Technology, startups and spinoffs.

With this policy in place, an investigation was launched to understand the trajectory and purpose of the potential habitat members. A fundamental element for consolidating an innovation habitat is a defined purpose

that allows aligning all the actors in the environment. Therefore, it was important to understand which potential partners would form the vision for the innovation habitat and their individual purposes.

The competencies were chosen as the starting point as they are more clearly defined elements and demonstrate the capabilities and trajectories of those involved, based on the assumption that identifying competencies constitutes a critical step toward meeting fundamental purposes. We surveyed to characterize the competencies of the main stakeholders in the developing innovation habitat. The survey, which was administered to all biotechnology graduate program researchers via Google Forms, included items that described their competencies. Based on the responses, the reported competencies were refined in some meetings with the researchers until a consensus was reached on how to describe the competencies required for research in a graduate biotechnology program and then synthesized.

Competencies incorporate explicit knowledge, but they also aggregate each researcher's tacit knowledge. According to Nonaka & Konno (1998), tacit knowledge, such as subjective insights, intuition, and opinions, is personal and hard to formalize, making it difficult to communicate or share with others. Tacit knowledge can be associated with the technical dimension, encompassing personal skills such as know-how, or it can be related to the cognitive dimension, which is based on an individual's actions and experiences, such as their beliefs, values, emotions, and mental schemes and models.

In the innovation habitat, knowledge is expected to be shared readily among individuals in a formal and systematic manner. Thus, the program's competency map was the first element to unveil the group's knowledge and implement strategies to seek partners to develop innovative projects. The map was used informally in meetings with businesses and the other habitat actors. The meetings did not follow a script or protocol for data collection and only sought to identify demands aligned with the competencies of the program's researchers. In this process, we identified the elements necessary to develop trust between the parties, such as synergy of purposes. It also enabled identifying these parties' competencies.

Figure 3 illustrates the result of these interactions with businesses; it represents the vision for the innovation habitat after interactions with students, researchers, and business managers within the university environment. The environment is influenced by the institutional culture of the university and its strategy. The innovation habitat follows the guidelines of the institution's innovation policy as the main reference for executing partnership contracts for entrepreneurial initiatives, such as the constitution of spinoffs and junior enterprises.

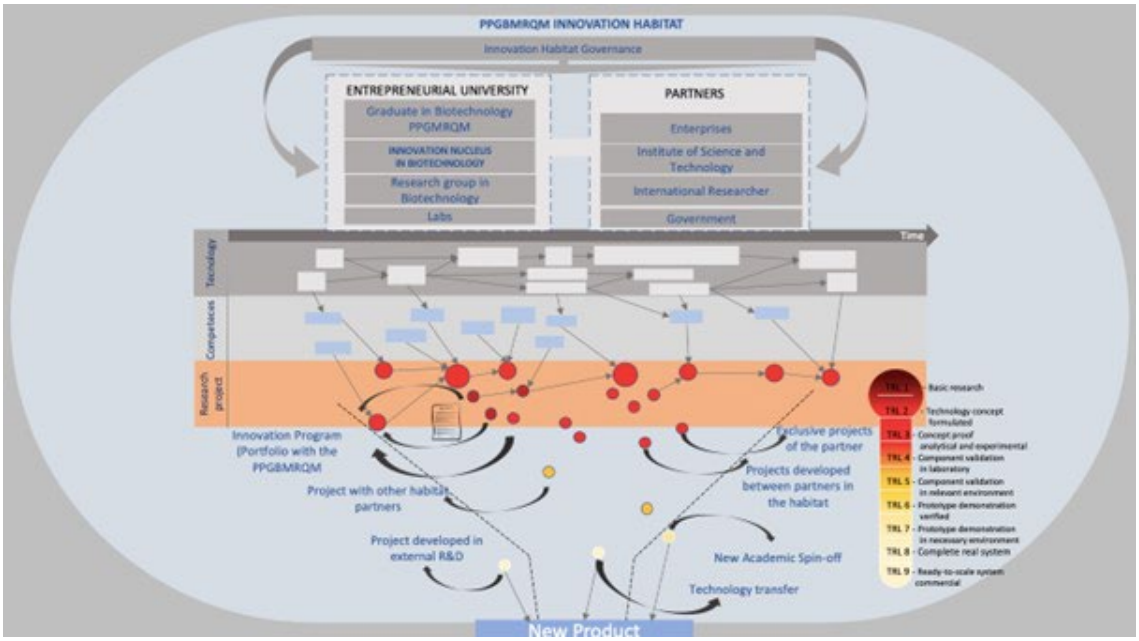

Figure 3. Project development within the Innovation Habitat. Source: Prepared by the authors.

The presence of junior enterprises in the innovation habitat's conceived vision is noteworthy because in the process of encouraging academic entrepreneurship, it incorporates an important actor into the environment: the undergraduate student. For the institution in question, constituting junior enterprises is a challenge, but one is currently in the initial stages of creation.

The other actors participating in the habitat are research groups, laboratories, Technological Innovation Nucleus, support foundations, researchers, graduate programs, undergraduate programs, junior enterprises,

businesses, spinoffs, startups, and the Institutes of Science and Technology. These groups must form partnerships to develop projects at different levels of maturity that are supported by the innovation habitat's infrastructure and contribute to consolidating and advancing the entrepreneurial culture. The habitat must establish a governance system to consolidate a healthy collaboration environment.

One question that arises is how to develop projects that integrate the stakeholders who make up the innovation habitat to make use of the potential of the competencies of the various actors in the habitat, aligned with a prospective analysis of the technologies in effect. The proposal is presented in Figure 4 and describes how projects can be generated within the innovation habitat's vision. The projects will be conducted according to the various technology readiness levels (TRL) and will involve different actors, using a model for technology development or product/service development as a reference.

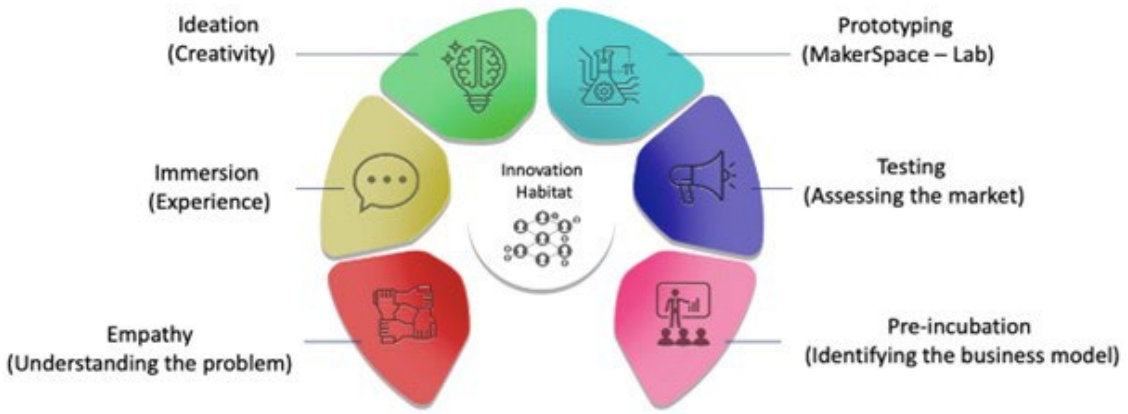

Figure 4. Biotechnology Innovation Habitat Model. Source: Prepared by the authors.

How innovative projects are defined follows an initial phase of technology exploration, as suggested by the TRM - Technology Roadmapping (Phaal et al., 2004). TRM uses the idea of mapping innovations, such as patents, competing products, market needs, necessary skills and the maturity of technologies to assess the best decisions in project design.

The innovation habitat's vision should collaborate with the understanding of the researchers affiliated with the graduate program about the importance of seeking new partnerships and collaborations to consolidate the innovation purposes that must be pursued.

In general, the innovation habitat vision proposed here is aligned with Nonaka & Konno's (1998) concept of "Ba" of value-added spaces for socializing and externalizing knowledge, which stimulates creativity and collaboration through virtual and in-person networks, thereby creating an atmosphere where knowledge can move through the entire cycle: extraction, generation, exchange, transmission, combination, use, and reuse.

The final vision of the innovation habitat model, following the contribution of the different stakeholders of the innovation process, is presented in Figure 4, which represents a condensed way. The model presents the main steps considered in the process of developing innovations, which are: empathy, immersion, ideation, prototyping, testing and pre-incubation.

6. Discussion and conclusion

Developing a model for academic entrepreneurship, such as the one proposed here, in conjunction with Supplementary Law 182/2021, the legal framework for startups, can contribute to consolidating innovation environments and enhancing a university's role as an agent promoting technological entrepreneurship.

The idea of a vision collectively constructed by potential actors to create an innovation habitat is a proposal that can be replicated, which would help validate the performance of innovation agents, professionals from governmental spheres, and academic administrators who are involved in entrepreneurial university initiatives.

The relationship between vision and competence mapping proved to be a possible approach to understanding potential actors (organizations and experts) in an innovation habitat. Therefore, the case shows that they can become important tools for innovation managers and agents. There should be further research and development of combined roadmaps for applying these techniques.

The resulting innovation habitat model serves as a guide for motivating and enabling the various actors in the process to generate new businesses (academic spinoffs) by promoting alignment between partners to enhance cooperation. The innovation habitat vision proposed here must be revisited continually to adjust and add new details using data from the innovation habitat. This allows evaluating the alignment and level of interaction among the actors, considering the following: the number of projects in partnership with businesses, the number of meetings with new contacts, the number of new projects, the type of contracts, the actors in the projects in partnership, the types of projects, and the maturity of projects.

We expect to share the proposal with all the program collaborators through guided meetings and workshops to generate new ideas to improve the concept of the innovation habitat for the graduate program and the institution and to make it more consistent. Additionally, we expect to examine developments in the form of projects and the consolidation of the innovation center in the graduate program.

The habitat model has the characteristics of the product vision property (Benassi et al., 2011b), such as being transparent, simple, flexible and also the elements proposed by Adner (2017), on the alignment between actors and on the structure – institutional space that promotes collaboration between economic agents and academia.

The result of the process of building the innovation habitat model, based on the concept of vision, is a relevant tool for the development of technology-based companies. It is an ad hoc construction. The model can be customized by any educational institution interested in implementing entrepreneurship actions. A limitation of the innovation habitat model is the low level of detail about the relationships between partners and their responsibilities in innovation projects. Further research should be developed to improve the model.

7. Acknowledgements

The research was supported by FUNADESP, through a research grant.

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