ÂNIMA HUB: New Research to Business Model for the Development of Technological Innovation and Entrepreneurship in Universities in Partnership With Companies

Samara Soares Leal[1], Flávio Henrique Batista de Souza[1], Rafaela Priscila Cruz Moreira[2] & Fernanda Cristina Kandalski Bortolotto[3]

[1] University Center UNIBH, Brazil

[2] University Center UNA, Brazil

[3] University Center UNICURITIBA, Brazil

Correspondence: Flávio Henrique Batista de Souza, University Center UNIBH, Brazil.

Received: December 1, 2023 Accepted: December 23, 2023 Online Published: December 26, 2023

doi:10.5430/ijba.v14n4p13 URL: https://doi.org/10.5430/ijba.v14n4p13

Abstract

Many efforts have been made to create a mutually beneficial environment for the development of innovation with interactions between universities, industry and government, for innovation. But there's still a lack of methodologies that design a journey for university students. This paper presents a proposal of a Research to Business (R2B) model called ÂNIMA HUB. A case study was developed with the Brazilian education group Ânima Educação (26 higher education institutions throughout Brazil). ÂNIMA HUB has been applied in these institutions, and it has been able to create 247 interdisciplinary research groups with more than 209 professors and 3500 students. The results show the scalability of the model and its ability to present a well-defined methodology that helps an idea to become a project, be published and become a business plan. In addition, 35 papers have been published and projects have been linked to companies for investment prospects and new business.

Keywords: research to business, higher education, ânima hub, innovation

1. Introduction

The teaching of entrepreneurship was pioneered by the Harvard Business School in 1947, according to De Carvalho Rocha et al. (2011). In Brazil, a significant portion of higher education institutions don't include structured interdisciplinary actions in entrepreneurship for different areas of knowledge, and among those that offer the discipline, there is a predominance of the application of traditional teaching methods, such as lectures and exercises, as pointed out by Ortega (2016) and Garcia (2012).

According to Ortega (2016), there is still a lack of researchers on how universities in developing countries, such as Brazil, practice entrepreneurship from the perspective of the academic triple helix (universities, industry, and government) with practical experiments. Furthermore, the literature reviews show that one of the biggest challenge is to create a culture of innovation and an entrepreneurial mindset in the university environment, especially if it's public, since some government institutions are strict and bureaucratic and it often takes a long time to forge alliances and bring the new products developed in the academic environment to the market.

Currently, academic entrepreneurship activities are identified as important tools for the economic and technological development of countries, mainly due to their ability to create businesses that are more intensive in scientific and technological innovation (Garcia, 2012). For some companies, investing in innovation is still a challenge because it's hard to find people with all the necessary expertise, financial investment, and infrastructure. In light of this, companies can benefit from bringing their innovation opportunities and ideas to be developed by research groups in universities, especially those related to technological innovation, which is a promising area today and has become one of the competitive differentiators for many organizations in the market.

In this new paradigm, universities are going through a moment of institutional transformation, taking on new roles (Etzkowitz, 2004) and need to establish themselves as key players in the entrepreneurship ecosystem (Martens and Freitas, 2008; Renault, 2011; Tuunainen and Knuuttila, 2009; Saes and Pita, 2007; Bronoski, 2008), but according to

Renault (2011), systematic and well-structured support is needed so that students and professors can create business and commercially exploit the results of their research in an academic environment and in partnership with companies, promoting a hybridization of public academic work and private business activity.

In this context, this paper presents a new proposal of a Research to Business (R2B) model called ÂNIMA HUB, based on the scientific method and the Scrum methodology, to develop technological innovation solutions by university students to real market opportunities from companies, government organizations and society. Scrum methodology is proven to be a tool that, when used in project development, allows the conclusion of tasks faster and efficiently, which ends up leading to a greater chance of success (VOGELZANG et al., 2020). In addition, its interactive character invites reflection on the learning process and evokes feedback between students and teachers (Orlov et al., 2021).

The main objective of this research is to show the ability of enhancing academic entrepreneurship potential through a well-defined model that has an organizational and procedural structure to design a journey composed of steps to take a technological idea and turn it into a potential business.

To do this, ÂNIMA HUB is organized by thematic Laboratories (Lab), a Lab is a structure organized by campuses to promote technological innovation projects in a thematic area: Health Lab (Health), Engineering Lab (Engineering), Legal Lab (Law), Agro Lab (Agriculture), etc., which are developed by multidisciplinary research groups of students led by professors (these groups are called Squads).

The journey designed for the Squads has a set of steps. According to Zikmund et al. (2013), all research, whether basic or applied, involves the scientific method. Thus, the ÂNIMA HUB model starts with the scientific method to help the Squad explore their ideas in exploratory research and writing papers, and ends with the delivery of a business plan and a Minimum Viable Product (MVP). This MVP is developed through the steps using a Scrum methodology (in which at each phase or sprint the product is incremented with new features in a continuous way) and developing this MVP allows teams to test the market demand for a product without investing a lot of resources (Almis and Sedera, 2022).

To test the applicability of the model, a case study was developed with the Brazilian private education group Ânima Educação, which has more than 26 higher education institutions throughout Brazil. The experimental results of this case study will be presented in section 5.

Before moving on to the results, this paper provides an introduction to this research in Section 1. Section 2 presents the related work in approaches to innovation and entrepreneurship in universities. Section 3 presents the main concepts and methods used in this paper. The details of the proposed model are presented in Section 4, and the experimental results and analyses are presented in Section 5. Finally, Section 6 summarizes the concluding discussions and remarks of the paper.

2. Related Work

Some research has synergistic elements to the purposes of this research, such as Ortega (2016) presents the Entrepreneurship School Program carried out in the University of São Paulo (USP), a Brazilian public university. In terms of research, the study case is carried out with only two groups of students and professors who went through a series of entrepreneurial activities during the program to develop their entrepreneurial mindset.

Two other studies are relevant, which motivates, including an analysis of the relevance for this research, as shown in Table 1.

Such research demonstrates that the connection between research and business, connected to scientifically based entrepreneurship issues represent challenges that are resolved with in-depth analyzes of each of the connections that are formed between knowledge and the remuneration of the resulting product. Resolutions that facilitate the union between the market and the rules of educational institutions are also necessary, so that it is as permeable as possible (which may represent the unviability or possibility of a business generated with research premises).

Table 1. Comparison and analysis of works from literature

Reference	Description	Analyzes relevant to this research
Basias and Pollalis (2018)	It analyzes in depth the issue of choosing a suitable research methodology to perform effective scientific research and is mainly based on linking research objectives to the characteristics of the available research methodologies. The research contemplates practices from the fields of Economics, Business and Technology.	The demonstration of results, considering the research methodology, must have an analysis that considers interdisciplinarity, since even if multiple areas are connected, the scientific method, whether quantitative or qualitative, must be carefully chosen so that the research is understandable and standardized.
Wright et al. (2009)	Institutional and resource-based theories were employed to examine the current role of business schools in academic entrepreneurship. The focus was to identify and understand the challenges facing business schools that contribute to the transfer of knowledge to enable academic entrepreneurship. A case-based method was employed, drawing on evidence from 42 interviews with technology transfer officers (TTOs), business school deans, business school entrepreneurship professors and scientists at eight UK universities.	It was possible to verify, even initially, the challenges of leading academic entrepreneurship towards the market. The challenges of technology transfers and such as incentives, connections, coding issues and human capital, the structure of the university organization must be able to facilitate the evolution of proposals, as the objectives of the innovation fronts and the purposes of the universities involved must be synergistic, to enhance the proposals. Otherwise, they will be pejorative considerations.

3. Theoretical Fundamentation

3.1 Research to Business

The research itself, with its analysis methods, whether qualitative or quantitative, assumptions that lead to the systematic production of knowledge and productions. However, the relevance of the proposed project from the perspective of making the result relevant to practical application in business and technology is a notable challenge (Basias & Pollalis, 2018).

This consideration is present even in the highest levels of qualification. According to Saunders and Lewis (2017), even researchers at master's and doctoral levels, even those who study and research Business and Management, have difficulty listing methodologies and applying research in business terms in practical terms. Connection optimization strategies between business concepts and the models to be adopted in practical terms have been evaluated for better results between the knowledge produced in the scientific environment for its conduction in the labor market (Massa et al., 2017).

Research in the last few years has been developed. As described by Wright et al. (2009), where in this study, resource and institutional theories are applied to examine the current role of business schools in academic entrepreneurship, identifying challenges in knowledge transfer. The research is case-based, with 42 interviews across eight UK universities, including business school heads, entrepreneurship professors and scientists. The challenges in the relationship between business schools and the main actors of academic entrepreneurship are analyzed: university management, technology transfer offices (TTOs) and science academics. It is found that, in addition to human capital concerns, the ability of business schools to fill knowledge gaps is limited by the institutional structures of universities, affecting strategies, connections between schools, transfer offices and scientists, as well as disparities in communication and incentives. It is concluded that for a more active role in academic entrepreneurship, it is essential

to develop internal processes and policies that promote knowledge exchange between schools, transfer offices and science departments.

Research with interviews and assessment processes are contemporary. As we can see in Stremersch et al. (2021), where his study examined the impact of faculty research incentives on academic research and the overall health of business schools. Surveys with 234 marketing professors and interviews with 14 (associate) deans and 8 external stakeholders were carried out. Research that reveals while research quantity affects research health, it doesn't influence other aspects of business school health. Rigor (r-quality) of research plays a stronger role in research health than quantity, whereas practical importance (q-quality) doesn't affect research health but positively influences teaching health and other school dimensions. The authors conclude that faculty research incentives are misaligned, as publication quantity is overemphasized compared to factors like creativity, literacy, relevance, and awards. Faculty feel undercompensated for research, while (associate) deans feel overcompensated. Misalignments are most pronounced in schools with lower research quality. The study explores potential solutions to rectify these incentive discrepancies within business schools and among faculty. Not only issues of transition between research and business, but also ethical issues have been discussed with current perspectives, as well as Fassin (2022).

Thus, this research brings as a contribution the practical experience of academics (students and professors) in a process of promoting projects that will cross the circles of the academic world, and connect with the business world with startups originating from academic projects.

3.2 Production Standardization Tools

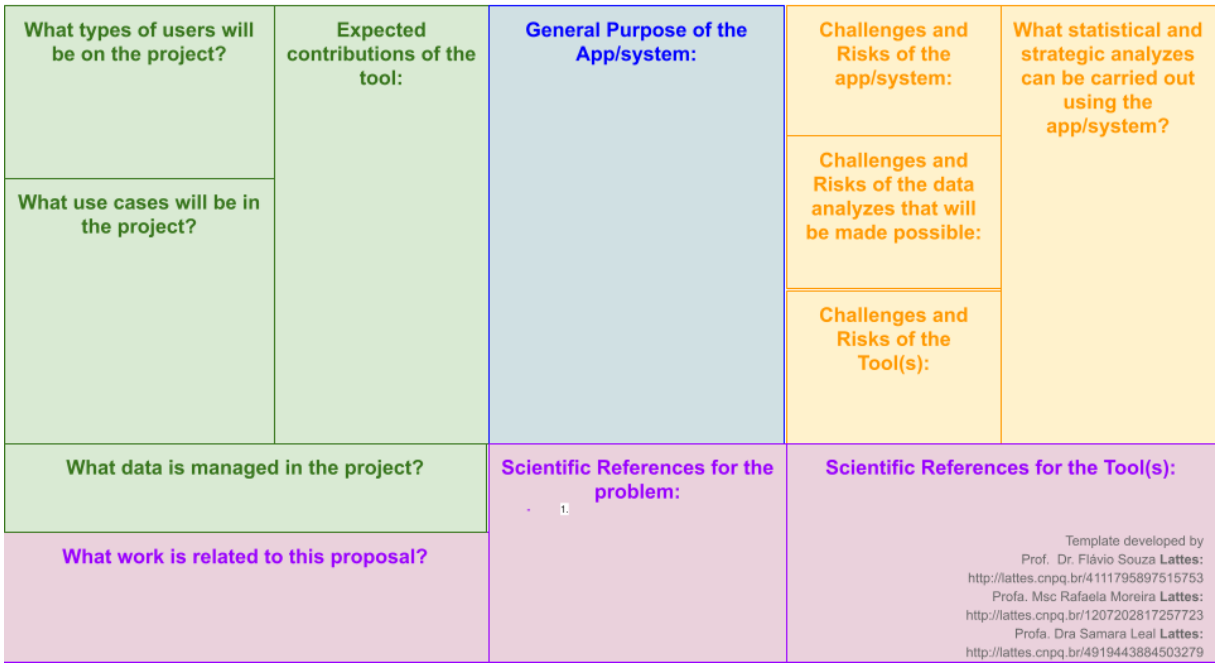
Standardized procedures have been, for many years, the reference for industry efficiency and effectiveness. To achieve this premise, tools were developed to guide methodologies and task execution in market challenges.

However, such tools are generalist, which gives them the ability to be used, regardless of the sector, that is, they can be used in engineering, health, law, agronomy environments and processes, among others. Therefore, its application could enhance communication between different areas, facilitating the understanding of demands and results with multiple areas of knowledge operating on the same problem. Furthermore, they can also make it easier to represent results both in market terms and in scientific publications and academic demonstrations.

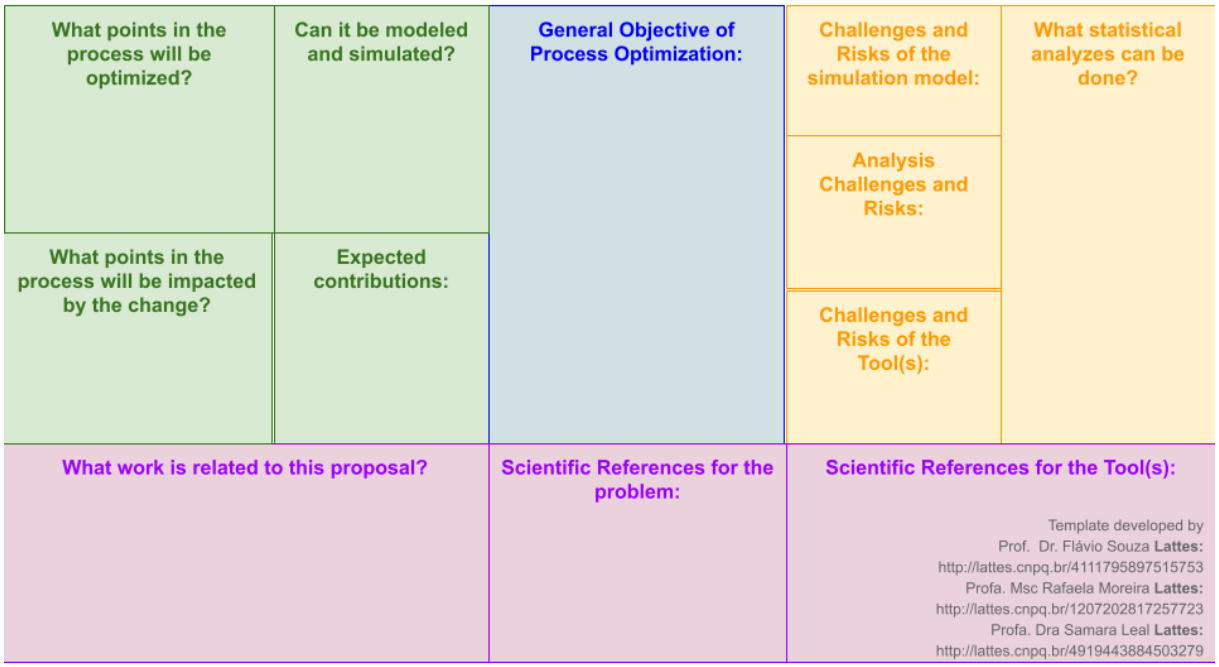
Thus, among many others, some tools are crucial for dialogue between areas to be effective, so that students and teachers from unrelated areas come to understand each other's statements: Canvas, Adapted Canvas, Organizational charts, BPMN (Business Process Model and Notation), SWOT (Strength-Weakness-Opportunities-Threats) Matrix.

The Business Model Canvas is one of the most used models to estimate and guide projects aimed at an enterprise. Its role is to summarize, with brief descriptions, elements that are fundamental for a company/service provider to start, maintain or evaluate its performance in the market. It is used not only to conduct analysis of projects that could arise, but also as a reference for creating models that are adapted to the demands of the project to be carried out, which resulted in elements that are called Adapted Canvas (Campbell *et al.*, 2017).

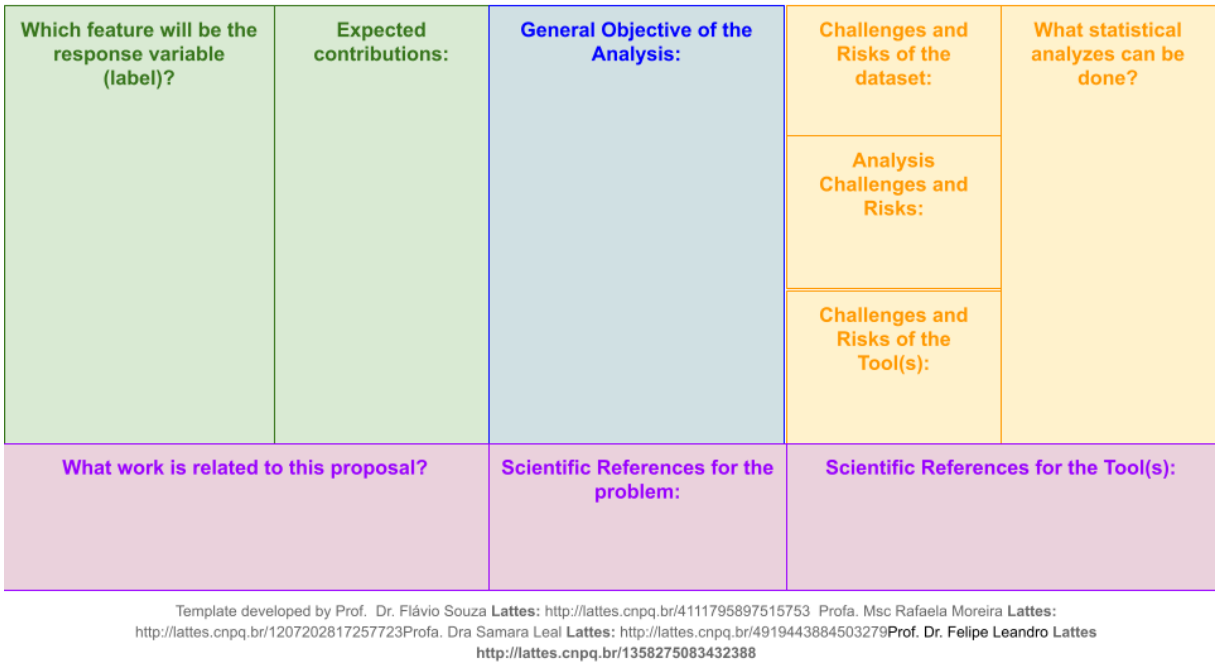
The Adapted Canvas, developed by Souza et al. (2020) as a standardized way of consolidating data from a technology-based project, so that information is described in simple ways (as in the original Business model canvas) but focusing on technology-based projects. Three main models were developed by Souza et al. (2020a), Souza et al. (2020b) and Souza et al. (2020c): solutions based on mobile applications and websites, solutions based on process optimization and, finally, solutions based on projects with artificial intelligence (AI) (Figure 1).



a - Canvas adapted for the development of Mobile Applications and Websites (Source: Souza et al., 2020a)



b - Canvas Adapted for Process Optimization (Source: Souza et al., 2020b)



c - Canvas Adapted for AI (Source: Souza et al., 2020c)

Figure 1. Adapted Canvas Templates

Organizational chart, despite being an old and common work tool, the effectiveness of a graphic description of mapping hierarchy and connections between people and sectors has never been questioned. However, an organization chart can very well be adapted for the structural description of tools, system screens, user organization or connections between circuit boards. Furthermore, its graphic description allows areas that do not deal, on a daily basis, with process organization, to understand technology-based solution organizations that may be presented by areas such as information technology, engineering and others (Rummler and Brache, 2012).

Business Process Model and Notation, similar to the organizational chart, BPMN is a visual demonstration. Once the hierarchy (whether of structures, users and related elements) is understood, an issue to be described is the processes involved. Such processes can be all that are present: the process of the problem to be solved, the process of functioning of the tool developed, the training of a user, the maintenance/repair of a part or system. BPMN, a very practical technique, which is widely referenced in some areas (such as engineering, technologies and others), is not always cited, used or mentioned in others, such as degrees, for example (Havey, 2005). Thus, your contribution will come, like the others, to enhance the transmission (both internally in work teams and in scientific reports and articles) of knowledge and operating methods.

The SWOT matrix is based on the premise that there is no perfect, unbeatable solution that has no elements to be improved. On the other hand, there is also no solution that does not have a minimum contribution that can be explored. Its concept is based on the consolidation of information that portrays the strength, weakness, opportunities and threats that surround the proposed project (Calicchio, 2020).

The tools described appear as a pillar of references to demonstrate the results obtained by the work squads in the labs in operation. They are not the only ones, since each area of knowledge has its own methods of analysis and demonstration of results, but they serve as elements of interconnection between multiple areas of knowledge.

3.3 Social Networks and Effects on Business

Scientific procedures and foundations will always be the reference for results with proven methods. However, it is clear that nowadays there is a value associated with the ability to transmit and disseminate knowledge through social networks. Furthermore, the proposal of Research to Business is that research becomes a product of value to the market, which validates the notoriety of the need for discoveries to be widely disseminated, not only in scientific conferences for validation and connection with the scientific environment, but also with events, both market and

academic, among others. This premise culminates in the possibility of connections, business, hiring and partnerships.

This analysis is not so recent, it is possible to cite works over two decades old dealing with this subject, such as Jenssen and Koenig (2002), in their research entitled "The Effect of Social Networks on Resource Access and Business Start-ups" they mention that in previous research expected entrepreneurs' social networks to impact their success by providing access to resources, which is confirmed in this study. While it's commonly believed that tie strength determines resource types, this assumption hasn't been tested before. Empirical data from Norwegian suggests entrepreneurs weak ties are crucial for finance, contrary to expectations, while strong ties serve as information channels, although the support for this assumption is partial.

A few years later, Egbert (2009) carried out another study on social networks and business success. The author also considers the importance of the connection between social networks and business success, but evaluates the opposing points of unilateral use that there is only success in using this type of communications. Thus, the author takes as a reference that there is the possibility of success, as advocated by other works, however there must be consideration, maturity and well-developed strategies for the connection to be truly effective.

Some studies from the last decade update some concepts, such as Pérez et al. (2014), who developed research with the purpose of analyzing the role of social networks and their effects on academics' entrepreneurial intentions (AEI), from an academic cognitive perspective. The authors focused on analyzing how business (distinguishing between industrial and financial connections) and personal social networks can influence academics' intentions to start a commercial venture based on their research knowledge. The mediating roles of entrepreneurial attitudes (EA) and self-efficacy in recognizing opportunities (SOR) as important psychological variables for academics were examined. An issue to be considered is that in its methodology, only 500 Spanish academics were considered. The results revealed positive effects of business networks (industrial and financial), both directly in promoting AEI and indirectly through EA and SOR. A relevant issue was considered as implications for the methodology, where, according to the authors "*they offer opportunities to shape government interventions to help academic entrepreneurs embarking on a commercial venture, or those who are already active in this aspect, increasing their effectiveness in construction, use and improvement of the quality of networking activities*".

More recently, in 2022, research on this type of analysis returns to the surface, including other associated elements, for example Tajpour et al. (2022) also include the issue of sustainability. In their experiments and analysis, which focused on "examining the effect of knowledge management components on the sustainability of technology-driven businesses mediated by social media in emerging markets", the authors relied on an analysis of 537 companies. Among all the research contributions, one draws attention to this article: "*effective participation in the organizational social network can activate knowledge management and create value. Thus, the acquisition of knowledge through social networks optimizes learning and ideation , and for technology-driven companies that lack resources, this acquisition enables development and sustainability in a dynamic environment*".

Thus, the concept of using social networks also permeated academic issues and student performance, as described by Tafesse (2022), where the use of social networks, specifically in relation to student performance, brings positive and negative points to their study.

Furthermore, for this article it is possible to infer that the use of social networks and academic events can enhance the dissemination of work and increase student engagement. However, to achieve such a result, robust planning must be carried out, as the use of social networks is not only linked to success, but also issues such as target audience, care with the content to be delivered, prior structuring of the objective of attracting students and partners, strategic points for content and demonstration of results must be heavily analyzed.

4. New Technological Innovation and Entrepreneurship Model Called Ânima HUB

The main objective of the Ânima HUB methodology proposed by this paper is to help in the development of hard and soft skills in university students based on real work market projects, making their academic journey and evaluation process more applied to real world needs.

The following assumptions were established as the basis for the HUB:

1. The Ânima Hub should serve as a reference and support for the formation of each Lab, in addition to serving as a point of orientation in its conduction;
2. Each Lab created with the guidance of the Ânima Hub must have its autonomy to manage its projects, expand and connect to partner institutions;
3. The squads led by advisors and students, together with partner companies, do not constitute an employment

relationship, curricular or extracurricular internship, as established in the contract and consent form.

4. The products and analyzes developed during the research must present scientific relevance for publications and/or products and analyzes that contribute to the pre-established demand;
5. The Rights involved in solutions, when in partnerships, must be previously and duly agreed between the parties (partners, Labs and Universities);
6. The products and analyzes generated, when relevant, must meet the requirements of the LGPD (General Data Protection Law);

To better explain the methodology, it will be divided into steps:

Step 1: A connection methodology (practices, techniques and approaches) between stakeholders will be proposed:

- coordinator, area manager and director of any Ânima institution: submit project proposals, indicate, contact and connect partners and professors, define relevant squads for the laboratory, define the necessary profile of students, seek financial resources for projects, issue feedback on solutions and opportunities.

- student: who plays an active role in the search for knowledge, in the development of skills and in the construction of his own learning. At the HUB, students have two roles: i) student leader, responsible for managing squad meetings, creating and managing message exchange groups using the WhatsApp application, creating squad performance and performance reports, monitoring generated scientific articles, manage social networks in the laboratory and ii) squad member, develops the project itself, writes an article about the project.

- teachers: who plays a crucial role in any educational process, performing multiple functions and responsibilities, such as facilitator of learning, transmitter of knowledge, motivator and inspiration. At the Hub, the professor has two roles: i) teaching leader, responsible for managing laboratories in thematic areas, conducting the necessary records of the squads, monitoring deliveries, assisting in the implementation of solutions, evaluating demands for records and legalities for patents/registration of possible market products, collect and act on feedback from partners and ii) advisor, responsible for guiding students in project development, recommending corrections and adaptations, defining deliveries and monitoring them, conducting meetings with partners and students, evaluating frequency and performance of students, guide and correct the writing of articles and project reports, evaluate congresses and journals for article submission.

- partner: indicate a company representative to be a communication channel, participate in a Discovery moment for the team to immerse themselves in the problem to be addressed, participate in follow-up meetings, participate in HUB events, issue feedback on solutions and opportunities.

To this end, various digital tools will be used, such as websites, WhatsApp, YouTube channels and Instagram profiles. These platforms will be used as means of dissemination, communication and interaction with the members of the squads. Through websites, it will be possible to present information about the projects, including objectives, activities, people involved, partners and results achieved. YouTube channels will offer the opportunity to produce video content such as tutorials, talks or demos, reaching a wider and more engaged audience. In addition, Instagram profiles will be used to share photos, videos and stories related to the projects, encouraging the participation and involvement of the academic community and companies. These digital tools will play a fundamental role in the dissemination and reach of the projects, enhancing their visibility and impact. As a result, the aim is a standard Business Model Planning for the formation of thematic Labs and connections with the market. In the development of projects, agile methodology is used, being an adaptation of Scrum.

Step 2: When the laboratory is formed, it is important that it has the capacity, when applicable, to establish connections and partnerships with companies from different segments of the market. These connections and partnerships can bring significant benefits, such as sponsoring processes, applications and projects. By collaborating with companies, the laboratory can obtain financial resources, access to specialized knowledge, opportunities for joint research and development, in addition to facilitating the transfer of technology between academia and the business sector. These partnerships promote an environment of collaboration and innovation, driving progress and the practical application of the results produced in the laboratory, in addition to promoting opportunities for hiring students.

Step 3: Finally, a quantitative analysis will be carried out, taking into account metrics such as the number of students involved in the squads throughout the project and the total number of articles published. This analysis seeks to measure the impact and productivity of the project, providing concrete data on student participation and the scope of scientific production. Through these metrics, it is possible to evaluate the success of the project in terms of student engagement, dissemination of knowledge and contribution to the academic community, aiming to show the relevance of the project in the academic context and beyond.

5. Experimental Results

The proposed methodology explores the ability to foster technology-based innovation, in academia, with a connection to real market demands and possibilities for generating ventures. However, during the execution of the initiative, there was a moment when it was possible to delimit these results between: the definition of the business model, the journey of building internal and external connections to the education ecosystem, a quantitative analysis and results from the executed projects.

5.1 Business Model Planning

Following the Personalization perspective, the area offers a network of hybrid and thematic laboratories, with the aim of accelerating innovative technological solutions, based on real demands that integrate theory and practice, in order to break with the fragmentation in the knowledge construction process and produce disruptive solutions, offering students a space that encourages entrepreneurship in the most diverse training areas of the Ânima Education Ecosystem, in partnership with large companies. The business model is based on the process in Figure 2,

- **Step 1- Proposal submission notice:** professors, students, those responsible for Ânima's areas of knowledge and companies indicate projects via notice.
- **Step 2 - Curation of proposals:** the Ânima HUB team receives the proposals and curates them.
- **Step 3 - Approval of proposals**: the Ânima HUB team approves the proposals with the directors and managers of the areas.
- **Step 4 - Development:** agile methodologies are used for project development. An adaptation of these methodologies was necessary to fit the needs of the HUB. After approval of the proposals, there is an announcement for the entry of students and advisors who will be part of the team of each project (squad). A squad is an organizational model formed by a multidisciplinary team responsible for a mission. Each team has 3 important moments during the development of projects: discovery, so that everyone has the same view of the problem; sprint 1, for the team to make a partial delivery of what was developed; sprint 2, for the team to make the final delivery for the semester. Projects that deliver value have the chance to present their project to influential people in IT and compete for an award for the best project.
- **Step 5 - Shark HUB:** A competition to encourage team engagement. In it, four main categories would receive the 40 best squads (10 for each of the categories: Agro & Health; Engineering, Design & Quantum; Legal & Business; Humanities, Social, Communication & Fashion)
- **Step 6: Feedback and Certification:** The participation of students and professors is proven with participation certifications, with assignment of workloads for participation in extension and research projects.

Figure 2. Project definition process, student enrollment and squad development

In short, opportunities, based on applied research and agile development methodologies, are connected to thematic laboratories, according to their perspective of academic area (health, law, engineering, management, education, social, hospitality, agrarian and interdisciplinary). Students and professors are connected in multiprofessional work squads for the continuous development of the product/service, with social, scientific, market and inclusion & diversity impacts. This connection methodology was taken as a reference and applied in an education ecosystem, the Ânima, which contains approximately 400,000 students.

5.2 Connection Journey

One of the premises of project execution is connections, both with external entities and with internal participants. As an example of external connections with companies (from different sectors and segments) and in addition to connections with entities and favelas throughout Brazil. These connections made possible contributions that go beyond the possibilities of financial or scientific returns.

In terms of connections with companies, including the different possible paths for the careers of professionals in training within the Ecosystem, the Ânima Lab HUB promotes the connection between our students and large companies in the national and international market, which, in turn, demand from our students innovative technological solutions for real market problems. In addition, there is a close relationship with government agencies and NGOs (Non-Governmental Organizations). So far, there are 104 partner companies in constant contact with our students. Figure 3 shows a sample of some of the listed partners.

Figure 3. Samples of logos from Ânima lab HUB partner companies

In addition to connections with possible impacts in terms of business, there were several connections with Brazilian favelas, with social impact work, maintaining the work aspect with a technological basis. One of the pillars of Ânima Lab HUB is the promotion of applied research with a view to social impact. In this way, we invite students and teachers to act as agents of social transformation by providing opportunities and developing various literacy and digital inclusion projects in more than 15 Brazilian favelas, based on the following initiatives (Table 2):

Table 2. List of Squads, Universities and connected organizations and benefited Outskirt

Squad	University and Organization	Shanty town
Favelaware Una	UNA, Obras Pavonianas e Mundiale	Barragem Santa Lúcia, Morro do Papagaio, Vila São José, Conjunto Santa Maria, Vila Leonina, Vila Estrela e Morro das Pedras, em Belo Horizonte/MG.
Favela Tech IBMR	IBMR, Gerando Falcões (Favela 3D) e Instituto entre o Céu e a Favela.	Favela da Providência, Rio de Janeiro/RJ.
Jovem Tech UniRitter Zona Sul	UNIRITTER e CUFA	Grande Cruzeiro, Porto

		Alegre/RS.
Jovem Tech Rosa USJT	USJT, Instituto Papel de Menino, Escola da Nuvem e AWS.	Meninas da Fundação Casa, São Paulo/SP.
Lady Tech UniRitter FAPA	UNIRITTER, Cootravipa e Themis.	Comunidades da Zona Norte de Porto Alegre/RS.
UNACODE	UNA e Superintendência Regional do Ensino de Divinópolis.	Escolas públicas de Divinópolis/MG.

In these initiatives, students, guided by professors, teach classes on digital thinking and programming for young people from peripheries. Thus, we encourage teaching, social responsibility and inclusion among our students, in addition to providing new experiences and JOB opportunities to residents of needy communities. Identities are created, as shown in Figure 4, with shirts and transport branded for each project.

Figure 4. Illustrative photo of the bus to transport the Favela Tech project to the Centro Universitário IBMR (Botafogo campus) and shirt models for the Favela Tech IBMR and Jovem Tech UNIRITTER projects

(a) (b)

(c)

Figure 5. (a) UNA professors and students at the Favelaware project graduation at Mundiale. (b) Teachers, NGO agents and IBMR and Providência favela students from the Favela Tech IBMR project with Gerando Falcões. (c) Opening ceremony of the Jovem Tech 2022.2 project, at Uniritter with the participation of students and teachers.

In addition to high-impact projects, we also carry out far-reaching events inside and outside the ecosystem, with prizes that are invested in the projects, boosting them even more each semester. Many of them, aiming to promote inclusion, diversity and strengthen plurality within the Ecosystem. Several events, as described in Figure 6, attracted 49,000 people so far, including students, communities, professors, external audiences, partners, celebrities, among others.

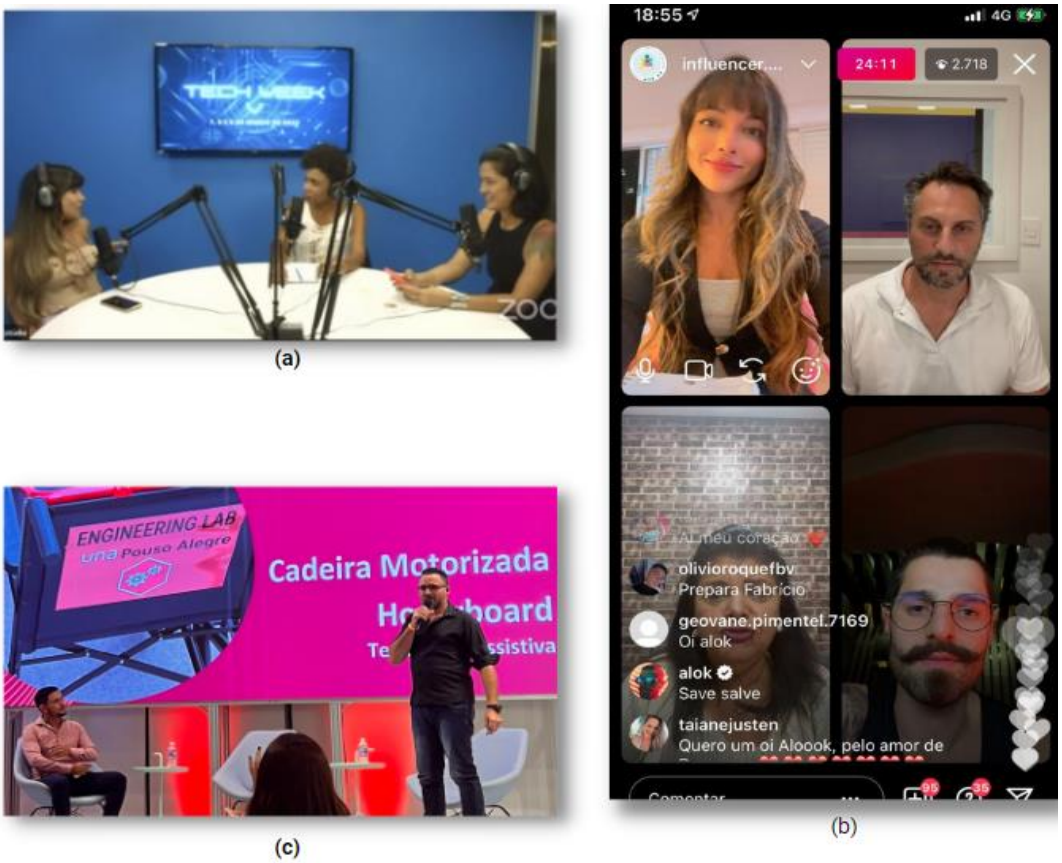


Figure 6. (a) Girls in Tech Podcast, in Teck Week 2023.1. (b) Project Influencer do Bem, together with Luiza Helena Trajano and Alok. (c) Adapted wheelchair project, winner of Shark HUB 2022.1.

Such connections are reinforced through specific events and actions. Ânima lab HUB also provides differentiated actions to enhance student deliveries and engagement in their projects. Lectures (with themes such as: entrepreneurship, applied science and innovation), meeting with entrepreneurs for conversation circles, hackathons with challenges and real partners, championships, among others (Figure 7).

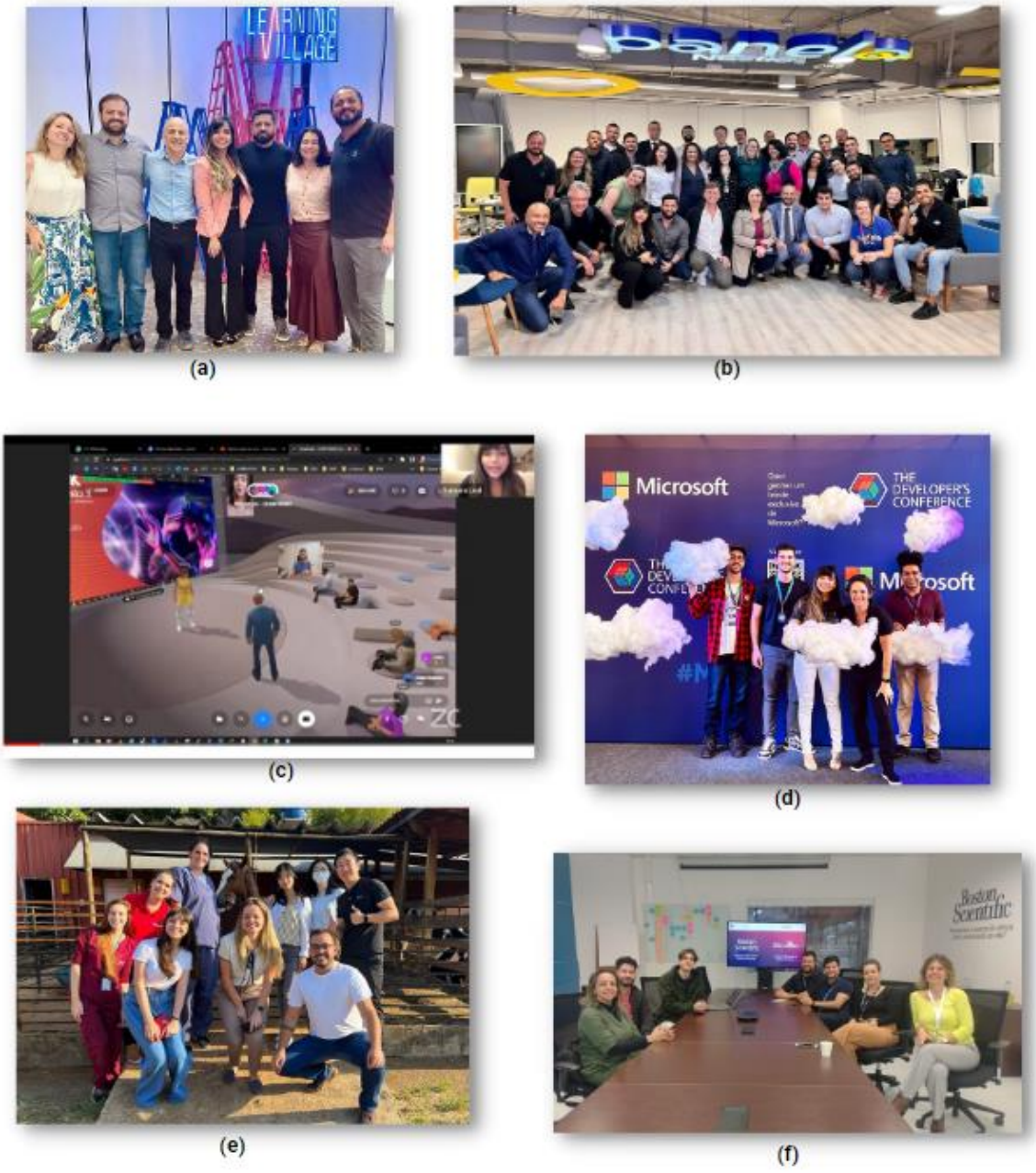


Figure 7 (a). Final Shark HUB 2022.1. at Panela Nestlè in São Paulo/SP (b). Final Shark HUB 2022.2. at the Learning Village in São Paulo/SP (c). Shark HUB 2022.2 semifinals at METAVERSO. (d). Participation in TDC event in Belo Horizonte/MG (e) Reception of the Chinese partner A Celer at the UNIBH Veterinary Hospital (f). Technical visit of Squad UC DUAL to partner Boston Scientific, in SP.

Thus, with such assumptions of connection and impact thousands of students, hundreds of teachers.

5.3 Quantitative Analysis

A quantitative analysis of results can have several aspects, since several results became present with the application of the methodology, such as: number of thematic laboratories, projects (squads) developed, scientific publications and repercussions in the media.

The labs' partnerships also bring countless different moments, such as openings of spaces provided by partners so that the projects take place in different places and connected with innovation. A real movement takes place during this process and over time, with the dissemination of the hub reaching the Ânima brands spread across Brazil, of approximately 8 thousand busy students, there was a growth of 155% between the years 2022 and 2023. owes to wide dissemination (with reports in renowned channels), connection of impact partners and significant returns for the student in their training. In a first quantitative analysis, one can refer to the number of impacted students, not only with projects, but actions and events of Ânima Lab HUB. Table 3 shows a number of impacted students per semester, since 2022.

Table 3. Statement of students impacted during HUB actions

Semester	Impacted Students
2023/1	24941
2022/2	10703
2022/1	9644

Another aspect of analysis is the number of projects. As mentioned, the projects assume an association between technology and the thematic area (example: Legal Areas generate Legal Labs), including a visual identity (logos) associated with each one of them, as described in Figure 8.

Figure 8. Logos of the laboratories, defining the development area of ongoing projects

The number in 2023 (first semester reaches 76 laboratories. Each one of them, with several accelerated projects in the most diverse training areas offered by Ânima, always in dialogue with technology. Table 4 shows a process of quantitative evolution of the number of laboratories , since the second half of 2021.

Table 4. Evolution of the number of thematic laboratories

Semester	Total Thematic Laboratories
2021/2	18
2022/1	37
2022/2	55
2023/1	76

In a brief analysis, the number of laboratories also impacts the number of squads (projects) in progress. Table 5 shows a process of evolution of the number of proposals worked over the semesters. Referring to the process described in Figure 2, after the enrollment process, students are connected to their work squad, where, together with the guiding professor, and in alignment with the partners involved in the project, they will execute the proposed project. It can be seen that there was an increase of 96.7% between the first half of 2022 and the second half of the same year. This increase was followed by another 28% increase in the first half of 2023. Obviously, since Ânima Educação has an ecosystem with a range of educational institutions, an analysis of the concentration of work squads according to the brand is in order. The brand with the highest number of projects is UNA, with 24.3%, as shown in Figure 9. In the distribution assessment, it is noted that some institutions are still starting the process of adopting the proposal, such as Faseh with 1, 3% of projects in operation.

Table 5. Evolution of the number of thematic laboratories

Semester	Total Thematic Laboratories
2021/2	59
2022/1	107
2022/2	161
2023/1	217

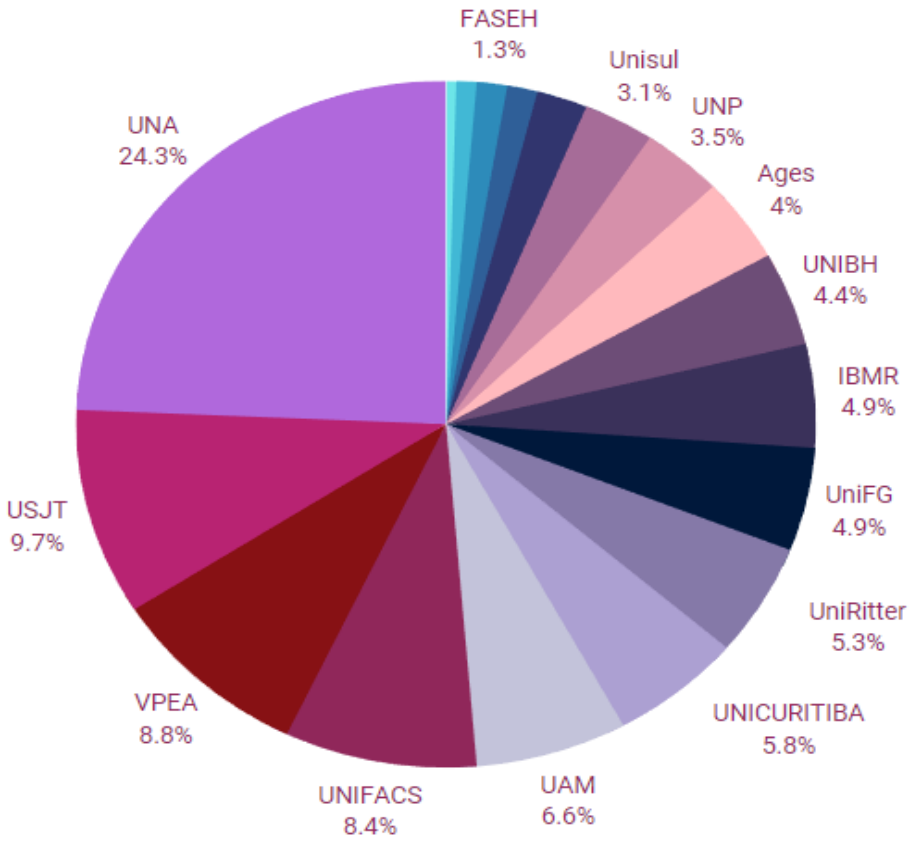


Figure 9. Percentage of Squads by Ecossistema Ânima Educação brands

With the evaluation of the number of projects developed, the number of scientific publications becomes possible. The developed projects must present a recognized relevance, both by the market and by the academic community, thus, the publication of scientific articles is encouraged and directly engendered in the HUB. Between the first semester of 2022 and the present day of 2023, there have been more than 35 scientific publications. Publications range from a regional congress, to events and renowned international scientific journals, where we have presentations by Squads in Europe (Germany, Spain, England, Ireland, Czech Republic, among others) and also in the United States. The publications reached such importance that they drew attention, not only from the media, but also from renowned institutions, such as the WHO (World Health Organization). Table 6 shows some examples of publications.

In addition to scientific publications, an expressive amount of repercussions in the media was obtained. Various media (portals or television) from newspapers, blogs, magazines have already reported the differentiated advances that were provided by the methodology for conducting projects at the HUB. There have been more than 28 media publications from the first half of 2022 to the current half. Communication vehicles such as: R7, Estado de Minas, Globo, Revista Encontro, among others, with regional, state and national repercussions, can be mentioned. Figure 10 demonstrates some examples.

Table 6. Examples of scientific publications

Lab	Paper
Health Lab UNIBH	(Souza et al., 2022)
Health Lab UNIBH	(Souza et al., 2021)
Inova Lab Lagoa da Prata	(Santos et al., 2022)
Engineering Lab USJT - Projeto Ozires	(Barbosa, et al., 2023)

Finally, metrics covering social media engagement can be mentioned. The public of students who are in the nima ecosystem, for the most part, is composed of young people who use, with high frequency, networks and social media. Youtube® and Instagram® are among the most used. With this perspective, a considerable increase in subscribers on the Youtube channel Ânima Lab HUB can be seen, with increases of more than 150% since the beginning of 2022, with more than 1000 subscribers.

It is also worth analyzing that the Instagram medium has been quite effective for the information and engagement process. From a number of 1384 followers in 2022, the profile today has more than 3200 followers. This had a direct impact on increasing student engagement in squad actions and work.

(a)

(b)

Metaverso bucal

A UniRitter reuniu professores e alunos dos cursos de Odontologia e Tecnologia da Informação para criar o Metaverso da Saúde. O ambiente virtual é utilizado para o aprendizado e experimentação. Nele, os estudantes podem simular procedimentos clínicos e interagir com modelos realistas, deixando os futuros dentistas mais seguros para quando forem atender pacientes.

A intenção da UniRitter, após desenvolver novas funcionalidades, é levar a novidade para outros cursos, como Fisioterapia, Veterinária, Engenharia e Arquitetura, por exemplo.

(c)

Figure 10 (a). Meeting of Health Lab and Galo Institute (ASSOPOC). (b). Article in the Estado de Minas newspaper - Health Lab and WHO (c). Article on Uniritter and HUB - for the Zero Hora newspaper

6. Conclusion and Future Studies

Ânima Lab HUB was able to develop a student and faculty engagement process, focusing on technology-based entrepreneurship with various perspectives of results. This entrepreneurship has achieved results that go beyond the viability of possible future businesses, such as: multiple actions with social impact applied in Brazilian communities, with contributions to the surroundings enabling employability of young people in situations of social vulnerability; engagement of the academic community in actions and events with possibilities for connections and business; scientific productions in renowned journals and conferences; in addition to impacts that were conveyed by the media, such as effective actions on the academic community.

It is also worth analyzing that both tools that are used for market processes, with their due scientific support, were used as bridges of connection between the multiple areas that make up the Ânima Educação Ecosystem, appearing as a translation of demands and demonstration of results, where areas that were present during this interdisciplinary process were able to work together.

From this perspective, as future works to be developed, in addition to the increase in the number of projects , new practices are being developed, connecting the teaching structures of each area, so that the knowledge of HUB practices is already engendered in the course of the student of all teaching areas.

Acknowledgements

We thank Ânima Educação for all the support and space provided for the application of the proposed method.

References

Alwis, I., & Sedera, D. (2022). Minimum Viable Product in Information Systems Development Context: Systematic Mapping Study. *Australasian Conference on Information Systems, ACIS 2022 Proceedings*, v. 83, Melbourne.

Barbosa, P. G. N. M., Ramirez, B., Alves, C., Althman, C., Candido, F., Antunes, J., ... Ferraz, V. (2023). Processo Produtivo Do Projeto O.N.E. Para O Ânima Hub [*Production Process of the O.N.E. Project For The Ânima Hub*]. *Cadernos Acadêmicos*, *9*(1). 2023. Retrieved from https://portaldeperiodicos.animaeducacao.com.br/index.php/CA/article/view/18861

Basias, N., & Pollalis, Y. (2018). Quantitative and qualitative research in business & technology: Justifying a suitable research methodology. *Review of Integrative Business and Economics Research, 7*, 91-105.

Bronoski, M. (2008). A intenção empreendedora no ambiente universitário: caso UNICENTRO [*Entrepreneurial intention in the university environment: UNICENTRO case*]. *Revista Capital Cientfico-Eletrônica* (RCCe), *6*(1), 223-238.

Calicchio, S. (2020). *Swot analysis in 4 steps: How to use the SWOT matrix to make a difference in career and business*. Stefano Calicchio.

Campbell, A., Gutierrez, M., & Lancelott, M. (2017). *Operating model canvas*. Van Haren Publishing.

De Carvalho Rocha, E. L., *et al.*. (2011). Ensino de empreendedorismo nos cursos presenciais de graduação em administração em Fortaleza: um estudo dos conteúdos e instrumentos pedagógicos [Teaching entrepreneurship in face-to-face undergraduate administration courses in Fortaleza: a study of content and pedagogical instruments]. *Administração: Ensino e Pesquisa*, *12*(3), 393-414.

Egbert, H. (2009). Business success through social networks? A comment on social networks and business success. *American Journal of Economics and Sociology, 68*(3), 665-677. https://doi.org/10.1111/j.1536-7150.2009.00643.x

Etzkowitz, H. (2004). The evolution of the entrepreneurial university. *International Journal of Technology and Globalisation*, *1*(1), 64-77.

Garcia, R., *et al.*. (2012). Empreendedorismo acadêmico no brasil: uma avaliação da propensão à criação de empresas por estudantes universitários [Academic entrepreneurship in Brazil: an assessment of the propensity to create companies by university students]. *Iberoamerican Journal of Entrepreneurship and Small Business*, *1*(3), 36-63.

Havey, M. (2005). *Essential business process modeling.* O'Reilly Media, Inc..

Jenssen, J. I., & Koenig, H. F. (2002). The effect of social networks on resource access and business start-ups. *European Planning Studies*, *10*(8), 1039-1046. https://doi.org/10.1080/0965431022000031301

Martens, C. D. P., & Freitas, H. (2008). Influência do ensino de empreendedorismo nas intenções de direcionamento profissional dos estudantes. *Estudo & Debate*, *15*(1), 71-95.

Massa, L., Tucci, C. L., & Afuah, A. (2017). A critical assessment of business model research. *Academy of Management annals*, *11*(1), 73-104.

Orlov, E. V., Rogulenko, T. M., Smolyakov, O. A., Oshovskaya, N. V., Zvorykina, T. I., Rostanets, V. G., & Dyundik, E. P. (2021). Comparative Analysis of the Use of Kanban and Scrum Methodologies in IT Projects. *Universal Journal of Accounting and Finance*, *9*(4), 693-700.

Ortega, L. M. (2016). Programa Empreendedorismo-Escola: influenciando a Universidade por meio do tripé ensino, pesquisa e extensão [Entrepreneurship-School Program: influencing the University through the teaching, research and extension tripod]. *Revista de Administração, Contabilidade e Economia da Fundace, 7*(1).

Pérez, V. F., Galicia, P. E. A., Fuentes, M. D. M. F., & Ariza, L. R. (2014). Business social networks and academics' entrepreneurial intentions. *Industrial Management & Data Systems*, *114*(2), 292-320. https://doi.org/10.1108/IMDS-02-2013-0076

Renault, T. B., *et al.*. (2011). Empreendedorismo acadêmico na COPPE/UFRJ: Reflexões sobre empresas criadas com a participação de professores [Academic entrepreneurship at COPPE/UFRJ: Reflections on companies

created with the participation of professors]. *Revista Organizações em Contexto*, *7*(14), 1-28.

Rummler, G. A., & Brache, A. P. (2012). *Improving performance: How to manage the white space on the organization chart*. John Wiley & Sons.

Saes, D. X., & Pita, F. H. S. (2007). Empreendedorismo no ensino superior: uma abordagem teórica [Entrepreneurship in higher education: a theoretical approach]. *Maringá Management: Revista de Ciências Empresariais*, *4*(2), 33-41.

Santos, A. L. F., Silva, B. G. P., Lacerda, E. A. S., Andrade, G. F. D., Oliveira, G. A. G., Lourenco, I. H. A., ... Souza, F. H. B. (2022). High and Higher Education Associates to Meet Market Demands: A Case Study of the Brazilian Health Sector in the City of Lagoa da Prata. In *4th International Conference on Modern Research in Education, Teaching and Learning*, 2022, Barcelona. *Proceedings of the 4th International Conference on Modern Research in Education, Teaching and Learning*. https://doi.org/10.33422/4th.icmetl.2022.04.165

Saunders, M., & Lewis, P. (2017). *Doing research in business and management*. Pearson.

Souza, F. H. B. D., Leal, S. S., & Moreira, R. P. C. (2020a). Canvas Adaptado para Aplicações Mobile [*Canvas Adapted for Mobile Applications*].

Souza, F. H. B. D., Leal, S. S., & Moreira, R. P. C. (2020b). Canvas Adaptado para Otimização de Processos [*Canvas Adapted for Process Optimization*].

Souza, F. H. B. D., Leal, S. S., Moreira, R. P. C., & Conceição, F. L. A. D. (2020c). Canvas Adaptado para estudos de Inteligência Artificial [*Canvas Adapted for Artificial Intelligence studies*].

Souza, F. H. B., Leal, S. S., Reis, M. A., Santiago, R. C., Rocha, L. L. D. O., Faria, M. L. B., ... Slailati, Y. C. L. (2022). Virtual Patient: Development of a Clinical Cases Simulator as a Tool for Medical Education. In *5th International Conference on Research in Applied Science, Berlin*. *Proceedings of the 5th International Conference on Research in Applied Science*, 2022. https://doi.org/10.33422/5th.rasconf.2022.03.01

Souza, G. L., *et al.*. (2021). 969. Gamification for Infectious Diseases Medical Education: Creating a Videogame to Teach COVID 19 Diagnosis and Treatment to Medical Students. *Open Forum Infectious Diseases*, 8(Supplement_1), S576-S577. https://doi.org/10.1093/ofid/ofab466.1164

Tafesse, W. (2022). Social networking sites use and college students' academic performance: testing for an inverted U-shaped relationship using automated mobile app usage data. *International Journal of Educational Technology in Higher Education*, *19*(1), 1-17, 2022. https://doi.org/10.1186/s41239-022-00322-0

Tajpour, M., Hosseini, E., Mohammadi, M., & Bahman-Zangi, B. (2022). The effect of knowledge management on the sustainability of technology-driven businesses in emerging markets: The mediating role of social media. *Sustainability*, *14*(14), 8602. https://doi.org/10.3390/su14148602

Tuunainen, J., Knuuttila, T. (2009). Intermingling academic and business activities: a new direction for science and universities?. *Science, Technology, Human Values*, *34*(6), 684-704.

Vogelzang, J., Admiraal, W. F., & Driel, J. H. V. (2020). A teacher perspective on Scrum methodology in secondary chemistry education. *Chemistry Education Research and Practice*, *21*, 237-249.

Wright, M., Piva, E., Mosey, S., & Lockett, A. (2009). Academic entrepreneurship and business schools. *The Journal of Technology Transfer*, *34*, 560-587.

Zikmund, W. G., *et al.*. (2013). *Business research methods*. Cengage learning.