# FORUM

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# A THEORETICAL FRAMEWORK PROPOSAL FOR RESEARCH AND INNOVATION OPPORTUNITIES IN ENTREPRENEURSHIP EDUCATION

## *Proposta de um modelo teórico para oportunidades de pesquisa e inovação em ensino de empreendedorismo*

## *Propuesta de marco teórico para oportunidades de investigación e innovación en educación emprendedora*

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## ABSTRACT

Entrepreneurship education has drawn the attention of many researchers, who aim to better understand and explain the phenomenon in universities and their innovation ecosystems. Although the research field of entrepreneurship education has advanced, there are still many aspects to be explored, such as the outcomes from university initiatives, evaluating the effectiveness of teaching and learning methods and practices, access and results of Entrepreneurship Support, development of the entrepreneurial ecosystem, professor qualification, classroom and experimental learning, and students' view. This paper brings a new perspective, both for research and management of entrepreneurial initiatives, showing the need for a more holistic and integrated view of entrepreneurship education with other areas, such as entrepreneurship support at the university, entrepreneurship ecosystem, and the entrepreneurial process. From an extensive literature review, we suggest a theoretical framework for research on entrepreneurship education and entrepreneurial university.

**Keywords**: entrepreneurship education, entrepreneurial university, entrepreneurial process, entrepreneurial ecosystem, innovation ecosystem.

## *RESUMO*

*O ensino do empreendedorismo tem atraído a atenção de diversos pesquisadores, com o objetivo de compreender e explicar esse fenômeno nas universidades e seus ecossistemas de inovação. Embora o campo de pesquisa em ensino de empreendedorismo tenha avançado, ainda há muitos aspectos que precisam ser explorados, como os resultados gerados pelas iniciativas universitárias, avaliação da eficácia dos métodos e práticas de ensino e aprendizagem, acesso e resultados do apoio ao empreendedorismo, desenvolvimento do ecossistema empreendedor, formação de professores, aprendizado em sala de aula e experiencial, e perspectivas dos estudantes. Este trabalho tem como objetivo trazer uma nova perspectiva, tanto para a pesquisa quanto para a gestão de iniciativas empreendedoras, apontando a necessidade de uma visão mais holística e integrada do ensino de empreendedorismo com outras áreas, como apoio ao empreendedorismo, ecossistema e processo empreendedor. O resultado da revisão da literatura é uma proposta de modelo teórico para a pesquisa em ensino de empreendedorismo e universidade empreendedora.*

***Palavras-chave:*** *ensino de empreendedorismo, universidade empreendedora, processo empreendedor, ecossistema empreendedor, ecossistema de inovação.*

## *RESUMEN*

*La enseñanza para el emprendimiento ha atraído la atención de diversos investigadores, que buscan comprender y explicar el fenómeno en las universidades y sus ecosistemas de innovación. Aunque el campo de investigación de la enseñanza para el emprendimiento ha avanzado, todavía hay muchos aspectos que deben ser explorados, como los resultados de las iniciativas universitarias, la evaluación de la efectividad de los métodos y prácticas de enseñanza y aprendizaje, el acceso y los resultados del apoyo al emprendimiento, el desarrollo del ecosistema emprendedor, la formación de docentes, el aprendizaje en el aula y experiencial, y las perspectivas de los estudiantes. Este artículo aporta una nueva perspectiva, tanto para la investigación como para la gestión de iniciativas emprendedoras, señalando la necesidad de una visión más holística e integrada de la enseñanza emprendedora con otras áreas, como apoyo al emprendimiento, y ecosistema y proceso emprendedores. El resultado de la revisión de la literatura es una propuesta de marco teórico para la investigación sobre enseñanza para el emprendimiento y universidad emprendedora.*

***Palabras clave****: enseñanza emprendedora, universidad emprendedora, proceso emprendedor, ecosistema emprendedor, ecosistema de innovación.*

## INTRODUCTION

Entrepreneurship education has caught the attention of many researchers who wish to better understand and explain that phenomenon in universities and their innovation ecosystems. Although this research field has increased significantly, with many colleges and universities offering entrepreneurship-related courses (Kuratko, 2005), there are still several aspects to explore, such as the results and effectiveness of entrepreneurship education at universities (Shirokova et al., 2016), access to entrepreneurship support for developing students' drive (Nair *et al*., 2022; Spigel, 2017), and the establishment of an entrepreneurial ecosystem by universities (Isenberg, 2011, 2016; Wurth *et al*., 2022).

Studies on entrepreneurship in universities have predominantly focused on the methods, outcomes, and impacts of entrepreneurship education (Neck & Corbett, 2018; Nabi *et al*., 2017; Neck & Greene, 2011; Charney & Libecap, 2000), often portraying it as a catalyst for entrepreneurial outcomes. The literature highlights efforts to evaluate the effectiveness of entrepreneurship education, particularly through the analysis of the methods and practices employed (Neck & Corbett, 2018; Neck & Greene, 2011). While the mapping of entrepreneurial ecosystems, the recognition of the relevance of regional contexts (Isenberg, 2011), and support for academic entrepreneurship (Spigel, 2017) are critical for fostering entrepreneurial opportunities, there remains a paucity of theoretical frameworks and limited empirical studies exploring the integration of entrepreneurship education with these fields and ecosystems. This integration could offer a more comprehensive understanding of the entrepreneurial process and contribute to the enhancement of research efforts and entrepreneurial initiative outcomes within universities..

Likewise, together with the need for a broader and more comprehensive understanding of the mechanisms that govern entrepreneurial ecosystems (Wurth *et al*., 2022), universities require a more integrated view of the areas and the internal and external mechanisms (university leadership, entrepreneurship education, entrepreneurship support, and ecosystem development) involved in the entrepreneurial process to reach better results and study their impact on this process. Future research should explore the outcomes of different types of universities by analyzing their operational environments and how dynamic capabilities (organizational skills to adapt to market and social demands) affect the relationship between academic entrepreneurship and external environments for value creation or capture to identify effective strategies for managing entrepreneurship in different contexts (Heaton *et al*., 2019, 2020; Leih & Teece, 2016; Thomas *et al*., 2021).

We observed that many universities focus only on entrepreneurship education without providing adequate support to students or considering a broader innovation ecosystem for developing entrepreneurial opportunities. The same happens with research on entrepreneurship, which often stresses entrepreneurship education, paying less attention to the support and integration of these areas throughout the entrepreneurial process. Therefore, this paper brings a new perspective to research and management of entrepreneurial initiatives, showing the need

for a more holistic and integrated approach to entrepreneurship education with other topics, like entrepreneurship support system, entrepreneurial ecosystem, and entrepreneurial process.

The entrepreneurial university approach points to this holistic view, as it involves the "quadruple helix" integration, fostering university partnerships with public and private stakeholders. This model shows that universities can lead an innovation ecosystem involving public and private actors (Heaton et al., 2020), facilitating collaboration and coordination between stakeholders: academia, government, industry, and community (Quadruple Helix model). An integrated view of the entrepreneurial process at universities and disseminating the entrepreneurial university model can assist in designing and analyzing pedagogical and institutional proposals connected to the academic environment to improve the quality of research and practice of entrepreneurship.

## THE NEED FOR A NEW RESEARCH FRAMEWORK ON THE EFFECTIVENESS OF ENTREPRENEURSHIP EDUCATION AT UNIVERSITIES

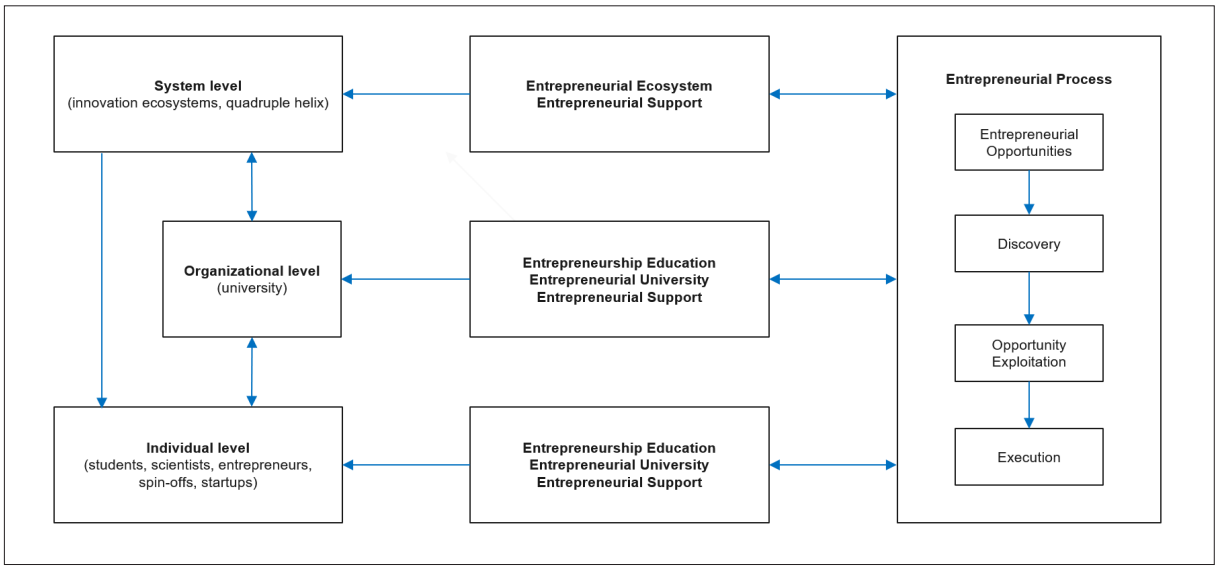
Access to entrepreneurship content has grown worldwide in recent years. Hence, it is relevant to understand the challenges and experiences in developing entrepreneurship education programs, which include teaching entrepreneurship at colleges and universities and developing students' projects and startups at business incubators.

This paper conducts a literature review on methods and practices of entrepreneurship education and support for entrepreneurship, entrepreneurial university models, and the entrepreneurial ecosystem to identify gaps in areas that require further empirical work and to propose a framework for future research on how universities create entrepreneurial initiatives from the theory and practice of entrepreneurship.

Proposing a strategic alignment framework (Figure 1) that considers a three-dimension model (individual, organizational, and systemic levels) to guide entrepreneurial universities stresses the importance of lining up goals and activities with entrepreneurial capabilities (Audretsch & Belitski, 2022). This framework was adopted to show the connection between the concepts of entrepreneurial university, entrepreneurship education, and entrepreneurial ecosystem regarding the university context. At the systemic level, knowledge transfer opportunities are shaped by regional economic development conditions, market demands, and the entrepreneurial ecosystem. At the organizational level, entrepreneurial universities seek to strengthen innovation mechanisms, such as investing in entrepreneurship education and linking research and industry. At the individual level, the demand for university knowledge creates commercial and non-commercial incentives that affect the entrepreneurial activities of faculty and students and knowledge creation by individual researchers (Audretsch & Belitski, 2022).

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**Figure 1.** Theoretical and Practical Integration in the Three-Dimensional Model of Entrepreneurial Universities




Note: Adapted from Audretsch & Belitski, 2022, p. 292 and Shane, 2003, p. 11.

The literature review identified gaps that require a broader vision of the entrepreneurial process within universities at all stages and how their internal mechanisms and interactions with surrounding ecosystems (system level) contribute to leveraging entrepreneurial opportunities (researchers, academic entrepreneurs) and achieving results for the market and society.

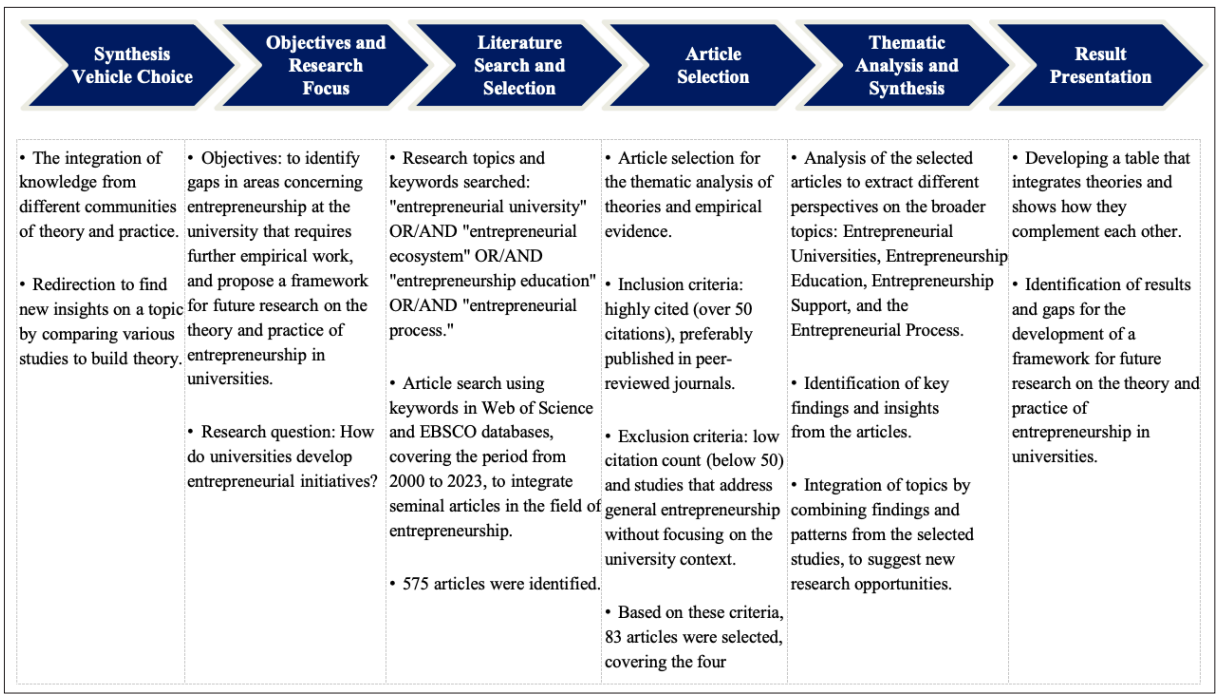
## METHODOLOGY

We used the integrative literature review, which accurately represents different perspectives and synthesizes that knowledge to generate new insights (Cronin & George, 2023). The review explored the current literature on entrepreneurial university, entrepreneurship education, entrepreneurial ecosystem, and entrepreneurial process from 2000 to 2023 in the Web of Science and EBSCO databases, identifying 575 articles. The most relevant, highly cited papers on entrepreneurship in universities, published in peer-reviewed journals, were gathered.

The selection process relied on our experience and knowledge of the topic, and the chosen criteria prioritized papers with significant insights and advances in their respective fields. Poorly cited articles were excluded (except for Markuerkiaga et al., 2019, who proposed an entrepreneurial university framework that included other reference authors). Studies that addressed entrepreneurship in general, without focusing on the university environment, were also excluded. Hence, we chose and analyzed 83 articles - 46 on entrepreneurship education, 18 on the entrepreneurial university, 6 on the entrepreneurial ecosystem, and 13 on the entrepreneurial process, from 2000 to 2023.

We adopted a redirection approach to find new insights in the literature review and build a theory on academic entrepreneurship by comparing several studies (Cronin & George, 2023). The literature review was done in six steps to synthesize and integrate results: Choice of Synthesis Vehicle; Objectives, Question Definition, and Research Topics; Inclusion and Exclusion Criteria; Article Selection; Thematic Analysis and Synthesis; and Result Presentation (Figure 2).

**Figure 2.** Integrative Process of Literature Review




## THEORY AND PRACTICE IN ENTREPRENEURSHIP EDUCATION: ASSESSING OUTCOME EFFECTIVENESS

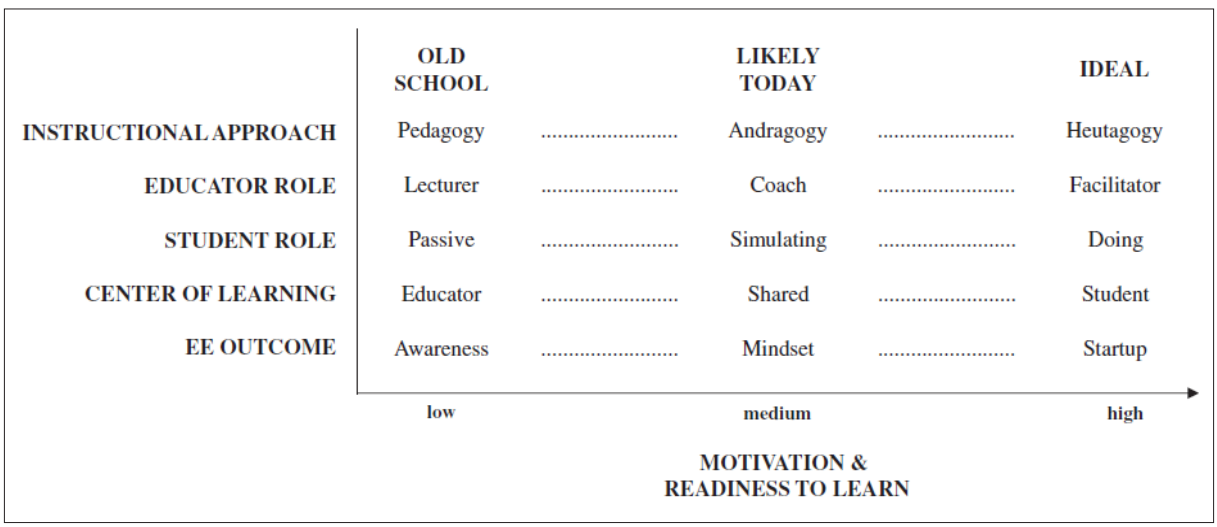
The concept of entrepreneurship education was defined and developed globally, using different methods and practices, with distinct authors analyzing its impact on the field of entrepreneurship and entrepreneur formation (Bae et al., 2014; Charney & Libecap, 2000; Fayolle, 2013; Graevenitz et al., 2010; Kirby et al., 2002; Kuratko, 2005; McClelland, 1965; Oosterbeek et al., 2010; Rasmussen & Sørheim, 2006; Shirokova et al., 2016; Sirelkhatim & Gangi, 2015). After doing broader empirical analyses on entrepreneurship education, some emphasized the need to differentiate entrepreneurship education from traditional business education, in form and content, since starting a business is different from managing one (Kuratko, 2005; Solomon et al., 2002).

Previous studies on academic entrepreneurship highlighted the benefits and positive outcomes of entrepreneurship education (Charney & Libecap, 2000); identified gaps in the correlation between entrepreneurship education and new business creation or expansion (Shirokova et al., 2016) or entrepreneurial actions (Kautonen et al., 2015; Sirelkhatim & Gangi, 2015)

after program participation; and explained how methods and practices of entrepreneurship education at universities influence entrepreneurial intention and attitude (Fayolle & Gailly, 2015; Fuller et al., 2018). However, the literature on entrepreneurship education lacks consensus on best practices, including curricula, content, and teaching-learning methods of entrepreneurship education programs and their effectiveness, thus showing research opportunities to explore, comprising evidence of the impact of practical guidance programs - incubators, accelerators, mentoring, and internships (Sirelkhatim & Gangi, 2015). For Neck and Corbett (2018), while research on student perspective and learning content was stressed, the educator perspective was little addressed, with poor evidence on what happens in the classroom. The authors highlight that research on entrepreneurship education has not progressed as fast as on entrepreneurship in general, partly due to the lack of focus on teaching and learning entrepreneurship education compared to other areas.

Neck and Corbett (2018) used the Delphi Panel, a research approach that collects opinions and insights from a group of experts on a specific topic, to get their views about entrepreneurship education and develop insights on how it could be improved and better understood. They designed the Entrepreneurship Education Continuum (Figure 3), which comprises a range of outcomes across distinct levels or aspects of the subject based on educator motivation and student availability to learn. The authors identified several dimensions or approaches (instructional approach, desired educational outcomes, learning focus, instructor role, and student role) that can vary in intensity or emphasis, helping the analysis of student motivation and readiness to learn and the suggested teaching approach, considering the following instructional elements: a) pedagogy: focuses on raising awareness about entrepreneurship through theoretical and expository knowledge; b) andragogy: seeks to develop entrepreneurial skills and mindset; c) heutagogy: develops students' ability to manage uncertainty and learn the entrepreneurial process independently.

**Figure 3.** Entrepreneurship Education Continuums



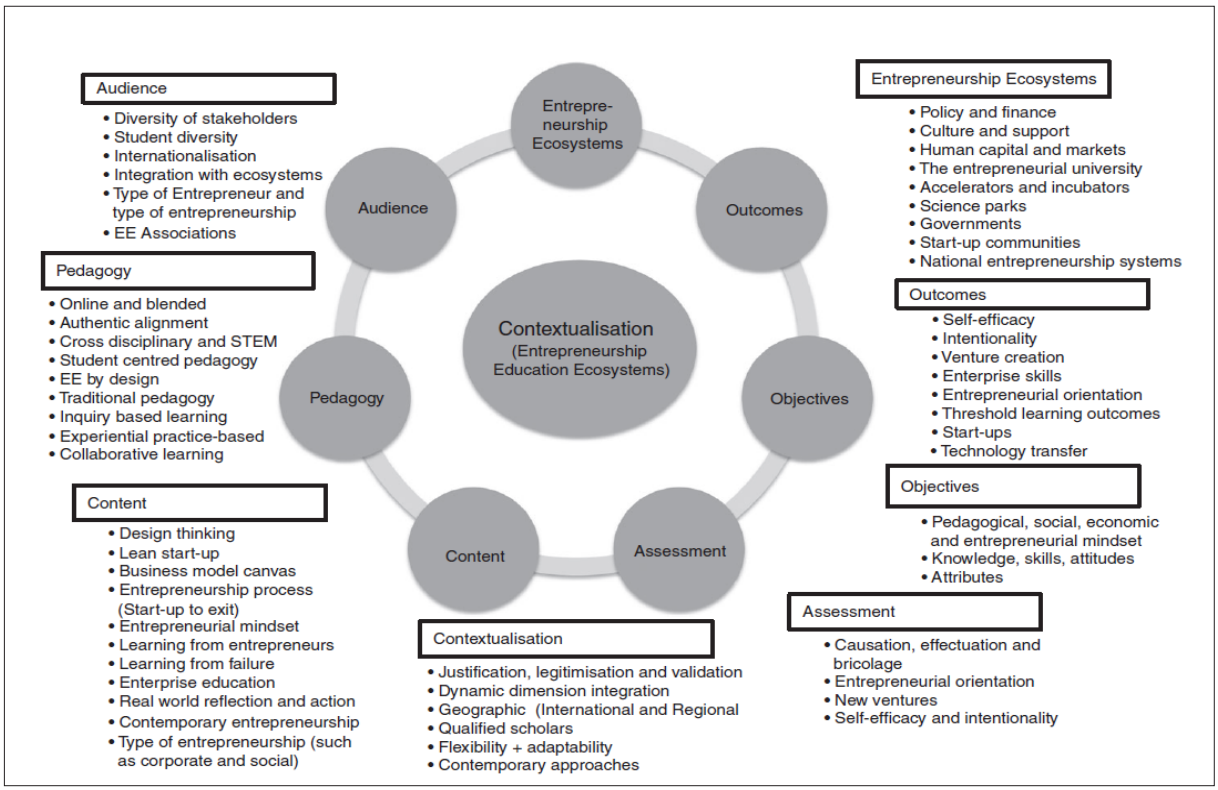

Note: Neck & Corbett, 2018, p. 31.

The authors argue that "EE [entrepreneurship education] has moved toward the middle and even toward the right for the most mature, advanced programs. Any educator operating on the left side of the figure [Figure 2] is not truly engaged in entrepreneurship education, and progression to the right is required" (Neck and Corbett, 2018, p. 31). They also mention that contemporary entrepreneurship education is more aligned with andragogy; however, they suggest that heutagogy may be more appropriate for highly dedicated students, given the challenging nature of entrepreneurship for autonomous learning. Pedagogy represents a more traditional approach and is considered less relevant in recent entrepreneurship education. We somewhat disagree with this perspective, as educators can use various complementary methods to achieve the learning objectives of entrepreneurship education at the university based on the context and students' maturity. This includes providing content by inviting successful entrepreneurs (who may be more to the left on the continuum) or by making students the protagonists (which is further to the right), simulating or starting a business, and using entrepreneurship as a method (Neck & Greene, 2011; Sarasvathy & Venkataraman, 2011). We agree with the authors on the importance of different teaching approaches for entrepreneurship education, mainly andragogy, which promotes self-directed learning in adults, and heutagogy, an extension of andragogy that emphasizes self-determined learning and students' ability to learn. In the context of entrepreneurship education, andragogy focuses on developing entrepreneurial skills and mindset, while heutagogy emphasizes students' ability to handle uncertainty and learn independently.

Furthermore, Nabi et al. (2017) observed that research on the impact of entrepreneurship education on higher education still focuses on short-term and subjective measures, as they tend to describe the current pedagogies used and assessed inappropriately. The authors suggest promising research directions, such as exploring new impact indicators related to entrepreneurial emotion and mindset, transitioning from entrepreneurial intention to entrepreneurial behavior, and investigating contextual reasons for contradictory outcomes, such as prior exposure to entrepreneurship, cultural context, individual factors, and pedagogical model.

A study based on a survey of 38 entrepreneurship education scholars (Maritz, 2017) was one of the first to help broaden the perspective and define the scope of entrepreneurship education in universities by presenting a model of the Entrepreneurship education program. This model maps entrepreneurship education themes from survey participants and is organized in eight dimensions. It addresses the limitations of entrepreneurship education and the need for an ecosystem to support students' entrepreneurial actions, among other aspects (Figure 4). The dimensions presented in the model can serve as a basis for the development of entrepreneurship initiatives in universities and for future research, considering the key aspects of entrepreneurship education dimensions for data collection and subsequent analysis of its performance.

**Figure 4.** Dimensions of Entrepreneurship Education




Note: Maritz, 2017, p. 477.

Next, we examine the entrepreneurial university literature to understand the new opportunities that have emerged from that concept, toward the development of entrepreneurship at universities, by connecting entrepreneurship education and innovation ecosystems.

## ENTREPRENEURIAL UNIVERSITIES: DYNAMIC CAPABILITIES, INNOVATION ECOSYSTEMS, AND MODELS FOR EFFECTIVE COLLABORATION

Entrepreneurial universities are higher education institutions that, besides providing support for the entrepreneurship process (entrepreneurship education, business incubation, support systems, access to investment), develop a framework for collaborating with government and industry to generate and exploit knowledge and technology (Guerrero & Urbano, 2012). These institutions stimulate an entrepreneurial culture that enables students, professors, and researchers to generate innovative ideas that become tangible actions in the market. "The university generates ideas and qualified human resources, while industry has the economic resources to transform ideas into economically useful products" (Guerrero & Urbano, 2012, p. 55). In addition to its teaching and research mission, the entrepreneurial university contributes to economic development,

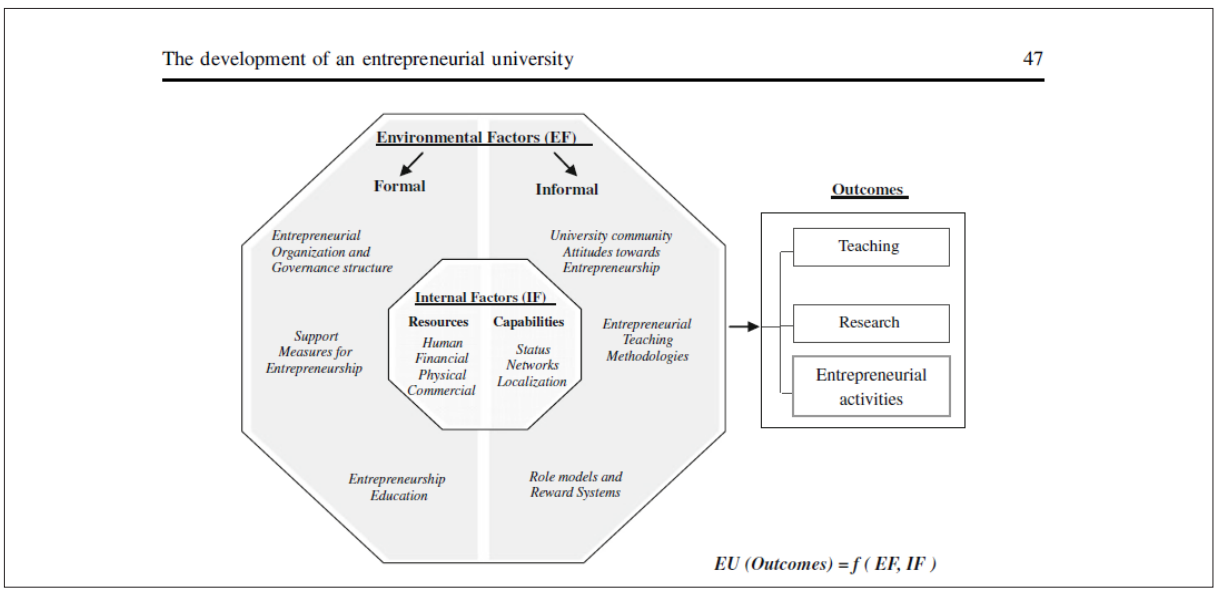
transfers technology to industry (Etzkowitz, 2016), and encourages the transition from traditional teaching to generating results and innovation that benefit its surrounding community.

Universities can lead an innovation ecosystem involving public and private actors (Heaton et al., 2020), and entrepreneurial universities are recognized for their ability to orchestrate regional innovation ecosystems, facilitating collaboration and coordination between different stakeholders (Thomas et al., 2021). In this context, one of the main concepts associated with entrepreneurial universities for increasing innovation in universities is the integration of the "Quadruple Helix model stakeholder," which emphasizes collaboration between "the general public, scientific communities, industry, and the local government" (Audretsch & Belitski, 2022, p. 290).

Etzkowitz (2016) further strengthens this view by suggesting metrics to assess the performance of entrepreneurial universities, stressing the need for an entrepreneurial culture and effective collaboration with industry and the community. Audretsch and Belitski (2022), Markuerkiaga *et al.* (2019), and Guerrero and Urbano (2012) have proposed theoretical frameworks to explain the entrepreneurial university, which we describe below.

Guerrero and Urbano (2012) suggested a model (Figure 5) with criteria to measure teaching outcomes, research, entrepreneurial activities, and social and economic development. These criteria included formal factors such as entrepreneurial organizational structure and governance, support measures for entrepreneurship and entrepreneurship education, informal factors like attitudes of the academic community toward entrepreneurship, entrepreneurial teaching methodologies, models, and reward systems. In addition, it includes human, financial, physical, and commercial capital resources, and capabilities like *status* and prestige, networks and alliances, and location.

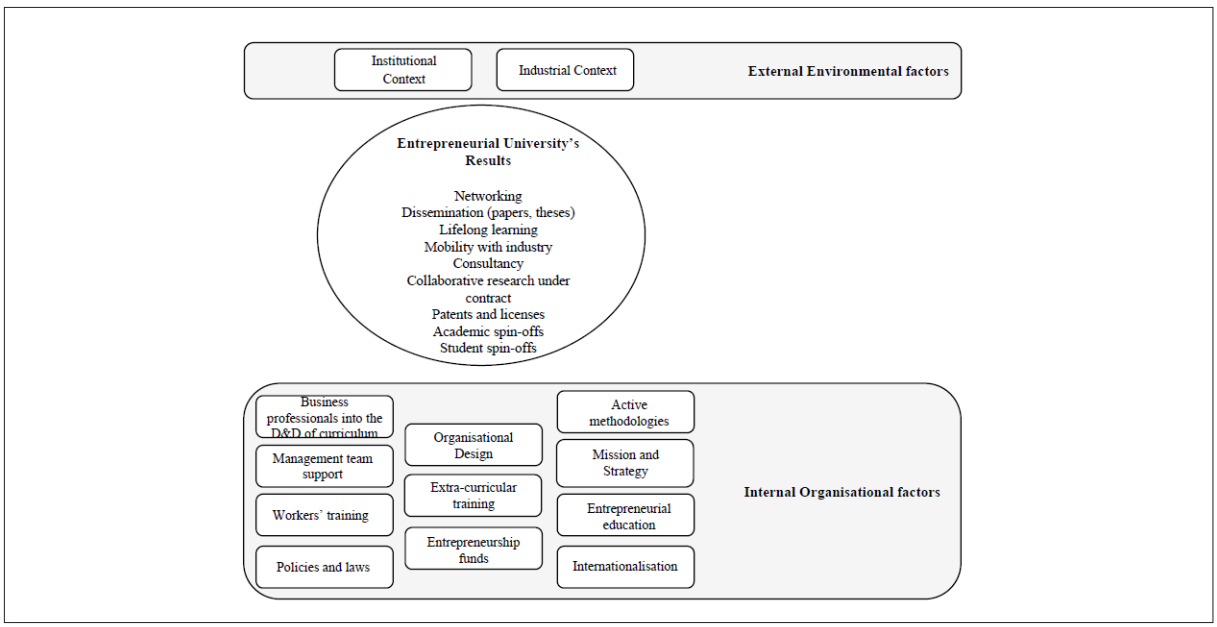
**Figure 5.** Conceptual Model of Entrepreneurial Universities




Note: Guerrero & Urbano, 2012, p. 47.

Markuerkiaga *et al.* (2019) proposed an entrepreneurial university framework (Figure 6), highlighting essential aspects for its success, including institutional context, industrial context, entrepreneurship funding, employee training in entrepreneurship, involvement of business professionals in curriculum development, university policies, management team support, organizational structure, formal and extracurricular education in entrepreneurship, active learning methodologies, and internationalization. They also emphasized that effective leadership by the management team is crucial for promoting an entrepreneurial culture; organizational structure should be developed to encourage entrepreneurial behaviors; entrepreneurial competence is a skill that can be mastered through entrepreneurship education at all levels; and internationalization is a vital element for the entrepreneurial university success.

**Figure 6.** Entrepreneurial University Framework




Note: Markuerkiaga et al., 2019, p. 194.

The entrepreneurial university frameworks described above show the importance of analyzing outcomes: networking, knowledge dissemination, patents, new businesses, etc. (Markuerkiaga et al., 2019), considering several external factors in the institutional and industrial contexts and internal factors of universities: training, entrepreneurship education, active methodologies, entrepreneurship funding, and internationalization. These factors can be formal and informal within the entrepreneurial university environment (Guerrero & Urbano, 2012) and take place at different levels: system, university, and individual (Audretsch & Belitski, 2022).

For the development of entrepreneurial universities and partnerships with other stakeholders (companies, governments, society), three aspects are relevant and deserve attention: a) dynamic capabilities, which involve campus leadership (Heaton et al., 2020; Leih & Teece, 2016), and b) innovation ecosystems (Heaton et al., 2019) and c) social development (Meek & Gianiodis, 2023).

According to Heaton et al. (2020), strong dynamic management capabilities of universities' leadership team (campus leadership) make up the core of dynamic capabilities, involving high-

level processes for targeting resources and activities to high-return ventures, encouraging and supporting a type of academic entrepreneurship that benefits the entrepreneurial campus and its ecosystem. Campus leadership has been underexplored in the literature. However, it plays an essential role in universities for strengthening and expanding innovation ecosystems through research, technology transfer, university-industry partnerships, and entrepreneurial activities. For Leih and Teece (2016), the presence of leaders who combine strategic thinking and capacity development enhances a university's competitiveness and long-term survival.

Heaton et al. (2019) proposed the dynamic capabilities framework (Table 1) to guide how universities should manage their innovation ecosystems. They analyzed three universities (Carnegie Mellon University, University of California at Berkeley, and University of Pennsylvania). The framework describes three stages of innovation ecosystems and the corresponding functions of universities: Initial, with the university as attractor (sensing); Development, with the university as consolidator (seizing); and Renewal, with the university as the change agent (transforming); and they contribute to understanding how innovation ecosystems, universities, and the regional economy interact. The findings of Heaton et al.'s (2019) case study provide best practices for each stage, helping to develop external partnerships and extending universities' impact.

**Table 1.** Stages of Innovation Ecosystems and Entrepreneurial Universities Functions

| Topics | Initial stage | Development stage | Renewal stage |
|---|---|---|---|
| Innovation ecosystem characteristics | • Few enterprises<br>• Rare interactions between the members of the ecosystem<br>• Low identity | • Supporting agencies and organizations become established<br>• Communication channels formed for exchanging knowledge in the ecosystem<br>• Inter-firm and professional networks become well established | • Stagnation of established sectors<br>• Renewal of the ecosystem to keep up with technological innovations and new markets<br>• Shift of patent activity to emerging or unexplored areas, adapting to new technological and market demands |
| University functions | **Attractors**<br>• Stronger regional focus on student recruitment and graduate retention<br>• Support faculty entrepreneurship and co-location of new and existing firms near the campus | **Consolidators**<br>• Support startup incubators Develop niche technologies<br>• Host networking events, business plan contests for students<br>• Create industrial liaison programs | **Change agents**<br>• Perform outreach with emerging technologies<br>• Pursue promising avenues of research<br>• Improve attractiveness of surroundings for skilled workers |
| Key dynamic capabilities | **Identification (Sensing):**<br>• Ability to identify and understand changes and trends. | **Implementation (Seizing):**<br>Capability to seize opportunities, resources, and initiatives for collaboration with external agents, such as private technology companies. | **Transformation (Transforming):**<br>Competence to lead and drive significant changes in environments (competitiveness, growth, and sustainable development). |
| Examples of Universities (USA) | Carnegie Mellon University | University of California, Berkeley | University of Pennsylvania |
| Selected key decisions by universities | • Identified key fields for new research programs<br>• Placed new emphasis on research and entrepreneurship<br>• Provided infrastructure for collaboration with private technology companies | • Fostered generation of new ventures<br>• Enhanced level of communication and cooperation among ecosystem participants<br>• Built linkages between university and local firms | • Developed a strategy that transforms its external environment<br>• Led local initiatives to revitalize its neighborhood<br>• Reoriented its culture |

Note: Adapted from Heaton et al., 2019, p. 6. (Heaton, S., Siegel, D. S., & Teece, D. J. (2019). Universities and innovation ecosystems: a dynamic capabilities perspective. Industrial and Corporate Change, 28(4), 921-939, P.6.)

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Meek and Gianiodis (2023) have a critical view of the current Entrepreneurship University Model (EUM), as it does not consider the real costs of the stakeholders involved. The authors acknowledge the importance of universities supporting the commercialization of science and business activities that facilitate regional economic development and job growth. However, they argue that the model benefits are restricted to elite universities, mostly private, despite the existence of around 1,200 EUMs globally. Without intervention, non-elite universities will continue to misallocate resources in search of illusory monetary gains from technology commercialization and related business activities. While science commercialization and university entrepreneurship can address social inequality, "universities that are very effective at harnessing, commercializing, and monetizing innovations that prompt creative destruction are able to garner more resources (i.e., revenue generation via licensing or spin-off activity) and protect better their rights to the technology (via patents), ensuring that the exclusive or semi-exclusive use of information creates a competitive advantage" (p. 68). Although the Bayh-Dole Act and similar laws worldwide (such as the National Innovation Policy in Brazil - decree no. 10,534, of October 28, 2020) gave decision-making autonomy to companies and university researchers, without a social component in entrepreneurial university initiatives that benefit citizens with the resulting technology, society will remain unequal.

Next, we address the concept of entrepreneurial ecosystem, which contributes to understanding the integration of the university with the market and society and how entrepreneurship education is embedded and operates within this context.

## ENTREPRENEURIAL ECOSYSTEM AND SUPPORTING ENTREPRENEURSHIP

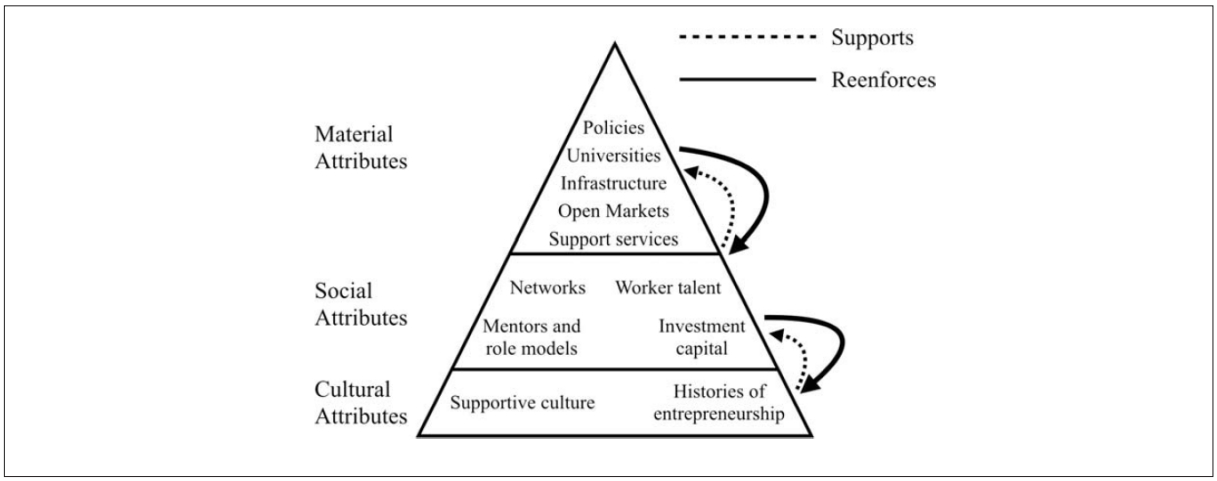
Since Isenberg (2011, 2016) mapped the entrepreneurial ecosystem domains, significant research and studies have been carried out (Wurth *et al.*, 2022), seeking to understand the implications of the entrepreneurial ecosystem, entrepreneurial behavior experiences, and the creation of businesses by potential entrepreneurs. Isenberg (2011) presented an initial comprehensive perspective of the complex ecosystem for sustainable entrepreneurship development, with around twelve elements consolidated in the diagram in six domains for convenience. They are always in a self-sustaining entrepreneurship ecosystem: policies, markets, finance, human resources, culture, and support.

Recognizing the complexity of the ecosystem, he suggested that public policies for entrepreneurial development should address several factors together. Also, to be self-sustaining, the different domains should be close to evolve together and strengthen each other. For example, entrepreneurship education can support capital building, and this, in turn, can support government reform.

Spigel (2017) defined the entrepreneurial ecosystem as "combinations of social, political, economic, and cultural elements within a region that support the development and growth of innovative startups and encourage emerging entrepreneurs and other actors to take the risks

of starting, funding, and otherwise assisting [sic] high-risk ventures" (p. 50). Entrepreneurial ecosystems are composed of 10 cultural, social, and material attributes (Figure 7), which provide benefits and resources to entrepreneurs, and the relationships between these attributes replicate the ecosystem.

Figure 7. Relationships between the Attributes of the Entrepreneurial Ecosystem



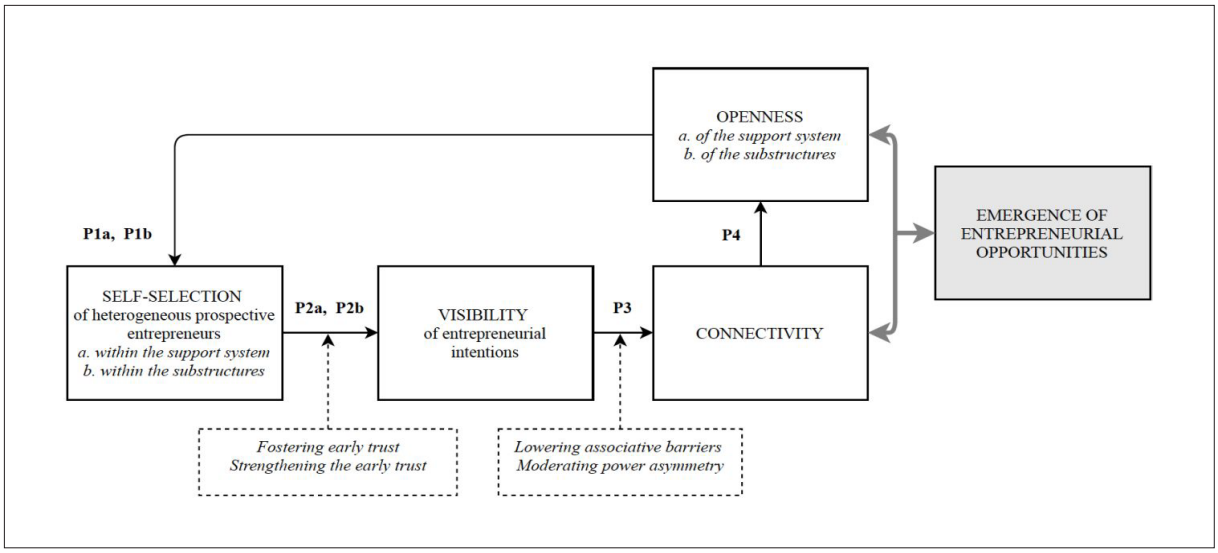

Note: Spigel, 2017, p. 57.

Spigel (2017) states that support services and facilities are critical in assisting startup companies. These include access to or referrals for specialized services tailored for startups, like accounting, legal consulting for patents, and human resources consulting, which are specific challenges for new businesses. These support firms enable startups to access resources, expertise, and abilities they may not have internally. The author further emphasizes the essential role of incubation facilities, accelerators, and coworking spaces, which provide cheap office spaces to startups and guidance and networking support. Despite some doubts about their effectiveness, these organizations are relevant facilitators of entrepreneurial activity and are often a focal point in entrepreneurial ecosystems.

Nair *et al.* (2022) proposed a dynamic model (Figure 8) for organizing entrepreneurship support systems in the early stages of new ventures, which analyzes university support, especially in the entrepreneurial process, through connectivity for creating and developing incubated businesses. These support systems facilitate the actions and interactions of potential entrepreneurs. They showed how the interaction between the organizational characteristics of openness (of the support system and related substructures), self-selection (of potential entrepreneurs), visibility (fostering and strengthening credibility to provide visibility to entrepreneurial intentions), and connectivity increases the emergence of entrepreneurial opportunities. Their findings helped develop organizational support systems that were more aligned with the nature of new venture creation. Many entrepreneurship studies mention uncertainty and non-linearity in opportunities arising in the early stages of new firms. This contrasts with the literature on support systems, which focuses on a linear and predictable view of the future.

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**Figure 8.** Support System Organization Model




Note: Nair et al., 2022, p. 17.

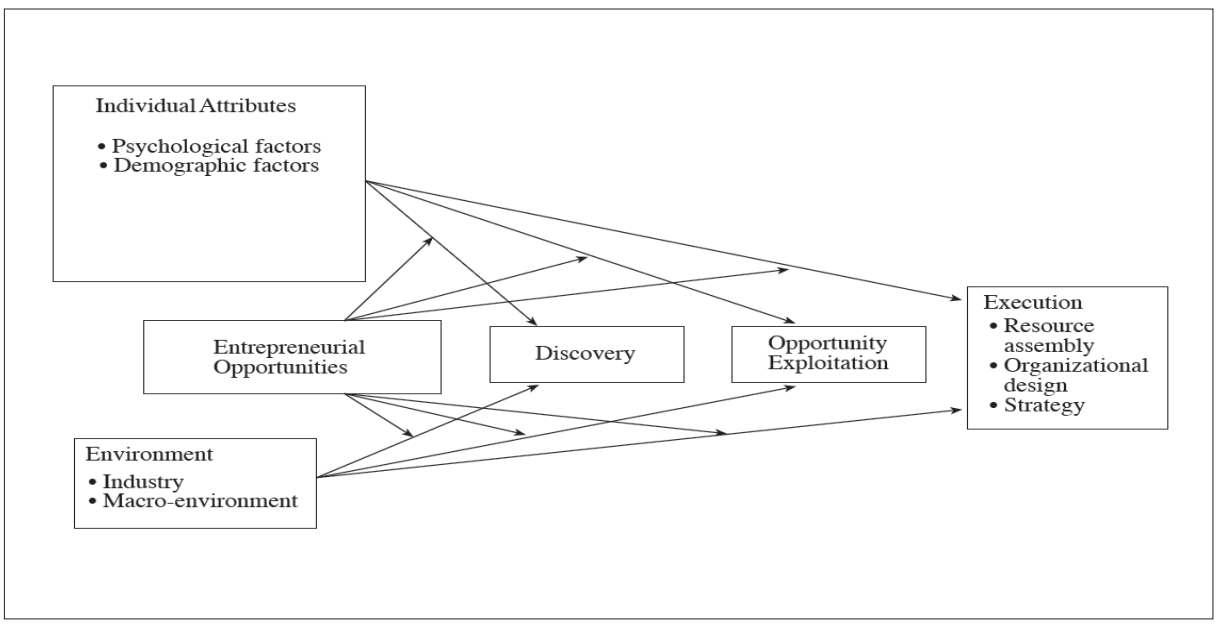
Nair *et al.* (2022) also argue that the paradoxical nature of "emergence of entrepreneurial opportunities" has not been appropriately addressed in the literature, failing to explain the initial stage of opportunity emergence, characterized by uncertainty and the complexity of newborn businesses. They also highlight the importance of endogeneity (actions, interactions, and decisions made by internal actors - entrepreneurs, facilitators, supporters - that occur inside the support system) and actor choices in the process of creating entrepreneurial opportunities and new ventures. In contrast, the support system literature often focuses on exogenous selection mechanisms (influences, decisions, and factors not directly involved in the process of entrepreneurial opportunity creation, such as government regulations, market influence, economic trends, competition, etc.). They also emphasize the need to consider aspects such as heterogeneity, trust generation, power moderation, and self-disclosure during the self-selection and self-organization process of actors in the early stages of entrepreneurship. The practical implications of their study include how the proposed model and its results can be applied in the real world and focus on the design and operation of support spaces for entrepreneurs, as well as recognizing the role of support systems in the early stages of the growth of local business ecosystems, by explaining how to design, keep, and invest in these systems to promote entrepreneurship and innovation.

The entrepreneurial process involves several stages that may begin with entrepreneurship education, covering opportunity identification, creation, and business development. Shane and Eckhardt (2003) proposed a three-phase direction: existence, discovery, and exploitation of opportunities. This direction was further refined in Shane's (2003) proposal for an entrepreneurial process model (Figure 9), detailing each phase and including execution and complementary stages, such as the entrepreneur's decision to chase the opportunity, acquisition of necessary resources, entrepreneurial strategy, process organization, and entrepreneurial performance.

The focus is on how the entrepreneur accesses and develops an identified opportunity and how universities can evaluate and contribute at each phase.

Shane (2003) updated the proposal for the entrepreneurial process model with four stages (Figure 8): a) Entrepreneurial Opportunities; b) Discovery of the Entrepreneurial Opportunity; c) Opportunity Exploitation; and d) Entrepreneurial Execution, explaining that "the entrepreneurial process involves the identification and evaluation of an opportunity; the decision whether or not to exploit it; the efforts to obtain resources; the process for organizing those resources into a new combination; and the development of a strategy for the new venture. These different activities are all influenced by individual-, industry-, and institution-level factors" (p. 10).

**Figure 9.** A Model of the Entrepreneurial Process




Note: Shane, 2003, p. 11.

Shane's entrepreneurial process model helps to identify the key educational, organizational, and methodological factors of entrepreneurship education that affect the career and business development of university students and entrepreneurs at each stage. The theoretical basis and practical applications of entrepreneurship education, with a specific focus on its integration with the entrepreneurial ecosystem and the entrepreneurial process, contributed to developing the Theoretical Framework for Research and Innovation Opportunities in entrepreneurship education.

In short, Isenberg's (2011) diagram proposal helped us understand the role of universities in fostering entrepreneurship, and in our study, it assisted in analyzing the entrepreneurship education teaching model and how the entrepreneurial process takes place regarding the external support that the university offers to students, resulting from partnerships with the entrepreneurial ecosystem where it is located. The attributes (cultural, social, and material) of the entrepreneurial ecosystem (Spigel, 2017) can help to analyze the support network for entrepreneurship, during and after students' graduation. We understand the importance of the elements (domains) of

the entrepreneurial ecosystem, especially universities and support networks for entrepreneurs, mainly in the early stages. In the next section, we outline the entrepreneurial process concerning opportunity exploration.

## DISCUSSION AND IMPLICATIONS

The results and gaps identified in the literature review made up the basis for developing a framework for fostering entrepreneurship initiatives within universities and changing them into entrepreneurial universities. Despite significant advances in research on entrepreneurship education at universities, the literature review (Table 2) shows the need for a broader perspective to understand this topic, considering individual and environmental factors that turn intentions into actions, defining the scope of entrepreneurship education, adapting curricula to market changes and student needs, and exploring educational entrepreneurship ecosystems in various regional and international contexts. Entrepreneurship education alone generates outcomes that are often difficult to measure and assigned exclusively to teaching methods and practices. The causal analysis of the entrepreneurship education outcomes in universities should consider other factors, such as support for entrepreneurship, support networks, the university's ability to make partnerships, and the development of entrepreneurial and innovation ecosystems throughout the process of business creation and expansion.

Eesley and Lee (2021) made a relevant contribution by assessing the correlation between university entrepreneurship programs and entrepreneurship rates at Stanford Business and Engineering Schools. They found that entrepreneurship programs may decrease these rates but contribute to entrepreneurs' self-awareness and startup performance (survival and firm revenue). Such studies should be encouraged to understand the phenomenon of entrepreneurship in universities since they analyze the impact of entrepreneurship education, opening up possibilities for new research approaches and entrepreneurship activities in other regional ecosystems.

The current literature on the entrepreneurial university (Table 3) reveals the need for more accurate metric systems and theoretical models to measure entrepreneurial universities empirically, examine how different types of universities generate outcomes, and how their dynamic capabilities influence academic entrepreneurship, value creation, and capture. Future studies should focus on universities in emerging countries, exploring how they can mobilize local actors to promote economic and innovative development. Models of entrepreneurial universities vary from one institution to another and across regional contexts, requiring adapted structures to address the specificities of each environment. Future research should explore how the strategic alignment between university goals (teaching, research, and outreach) and external demands (industry, government, and other stakeholders) affects the promotion of innovation and entrepreneurship, including the social component in entrepreneurial initiatives.

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**Table 2.** Literature Review on Entrepreneurship Education

| RELATED Topics | Topic | Author/Year | Main Findings | Implications for Future Research |
|---|---|---|---|---|
| Entrepreneurship Education, Entrepreneurial Universities | Importance of Entrepreneurship Education | Charney & Libecap (2000) | Entrepreneurship education fosters the creation of new businesses, increases graduates' income and satisfaction, and facilitates technology transfer to the private sector. | Entrepreneurship education programs are essential for developing entrepreneurial intentions, challenging universities to update curricula to prepare students for real business challenges. It is important to investigate empirically how educators and policymakers can encourage business creation by considering personal and environmental factors that turn intentions into actions. |
| | | Kuratko (2005) | Significant increase in the number of colleges and universities offering programs and curricula related to entrepreneurship. | |
| Entrepreneurship Education, Entrepreneurial Process, Entrepreneurial Ecosystem | Entrepreneurship Education and Business Creation | Shirokova et al. (2016) | Literature highlights a gap between entrepreneurship education and the creation of new businesses, considering that not all entrepreneurial intentions become real actions, influenced by contextual factors. | There is a lack of empirical data on the correlation between entrepreneurship education and business creation. Future research should consider individual and environmental factors in order to better understand business generation and its benefits to society. |
| Entrepreneurship Education, Entrepreneurial Process | Practical Methods in Entrepreneurship Education | Sarasvathy & Venkataraman (2011) | Entrepreneurship is a human action method that can address a wide range of problems in the human social domain. | Future research in entrepreneurship education should focus on identifying specific teaching mechanisms, evaluating the effectiveness of different pedagogical approaches, adapting curricula to market changes and student needs, and seeking consensus on the definition and goals of entrepreneurship education. |
| | | Neck & Greene (2011) | Pedagogical methods may not reflect the real practice of entrepreneurship. Introducing practical approaches, like starting businesses and simulations, can enhance students' ability to engage in entrepreneurship. | |
| | | Sirelkhatim & Gangi (2015) | Theoretical courses raise awareness of entrepreneurship, while practical courses develop entrepreneurial skills by simulating real business situations. | |

Continue

**Table 2.** Literature Review on Entrepreneurship Education — Concludes

| RELATED Topics | Topic | Author/Year | Main Findings | Implications for Future Research |
|---|---|---|---|---|
| Entrepreneurship Education | Future perspectives and Entrepreneurship Education Continuum | Fayolle & Gailly (2015) | Entrepreneurship education programs have a positive impact on students with little previous exposure to entrepreneurship. However, it may decrease the entrepreneurial intentions of those with significant experience in the field. | Customizing entrepreneurship education programs based on previous exposure, integrating diverse teaching and practice components, and using methods that promote specific self-efficacy and explore personality traits and future scenarios can maximize effectiveness in developing entrepreneurial attitudes and intentions. Future research should validate these entrepreneurship education models and explore educational entrepreneurship ecosystems in different regional and international contexts. |
| | | Maritz (2017) | The importance of contextualizing entrepreneurship and innovation ecosystems in entrepreneurship education programs, which should be adaptable and reflect current needs. | |
| | | Nabi et al. (2017) | Studies on entrepreneurship education in universities often focus on subjective and short-term measures, without detailing the pedagogies used and considering emotional factors, mindset changes, and the transition from intentions to entrepreneurial behavior. | |
| | | Fuller et al. (2018) | Entrepreneurial self-efficacy (belief in the ability to start and manage a business successfully) alone does not explain entrepreneurial intentions. However, proactive personalities have a positive influence on self-efficacy regarding learning and creativity, which in turn anticipates entrepreneurial self-efficacy. | |
| | | Neck & Corbett (2018) | The Continuum of entrepreneurship education suggests that best practices are more aligned with andragogy and heutagogy, which focus on autonomous and adaptive learning. | |

**Table 3.** Literature Review on Entrepreneurial University

| RELATED TOPICS | TOPIC | AUTHOR/ YEAR | MAIN FINDINGS | IMPLICATIONS FOR FUTURE RESEARCH |
|---|---|---|---|---|
| Entrepreneurial Universities, Entrepreneurial Ecosystem | Entrepreneurial University and Collaboration with External Sectors | Guerrero & Urbano (2012) | Entrepreneurial universities, in collaboration with government and businesses, are essential for economic development. The framework proposed seeks to understand the influence of internal and external factors and includes a model to analyze their stages of development. | Need for a more robust metrics system and theoretical model to empirically measure the phenomenon of entrepreneurial universities and to explore attitudes towards entrepreneurship among academics and students, and how these attitudes are influenced by factors such as entrepreneurship education, teaching methodologies, success stories, and incentives. |
| | | Etzkowitz (2016) | Universities are becoming more entrepreneurial, enhancing autonomy and stakeholder engagement, and integrating educational development with innovation. | |
| Entrepreneurial Universities, Entrepreneurship Education, Entrepreneurial Process, Entrepreneurial Ecosystem | Dynamic Capabilities and Innovation Ecosystems | Leih & Teece (2016) | Leaders who combine strategic thinking and capability development increase the university's likelihood of competitiveness and long-term survival. | Future research should examine how different types of universities generate outcomes and how their dynamic capabilities influence academic entrepreneurship, value creation and capture (strong leadership and the ability to manage innovation ecosystems are essential in this process). Future studies should focus on universities in emerging economies, exploring how they can mobilize local actors to promote economic and innovative development. |
| | | Heaton et al. (2019) | Universities must manage their innovation ecosystems dynamically and entrepreneurially, as case studies show their role in promoting local industries and revitalizing communities. | |
| | | Heaton et al. (2020) | There is a need for entrepreneurial university leadership to manage effectively the dynamic capabilities of innovation ecosystems, focusing on leadership, partnerships, and technology transfer, for their success. | |
| | | Thomas et al. (2021) | Universities in emerging economies take on the role of leaders in developing regional innovation ecosystems, going beyond their traditional mission of teaching and research in order to coordinate local innovation networks. | |

Continue

**Table 3.** Literature Review on Entrepreneurial University — Concludes

| RELATED TOPICS | TOPIC | AUTHOR/ YEAR | MAIN FINDINGS | IMPLICATIONS FOR FUTURE RESEARCH |
|---|---|---|---|---|
| Entrepreneurial Universities, Entrepreneurial Ecosystem | Models and frameworks of entrepreneurial university | Markuerkiaga et al. (2019) | Suggest a taxonomy of entrepreneurial universities by identifying three distinct groups in different stages of transformation, and analyzing internal and external factors that affect academic entrepreneurship and its outcomes. | Models of entrepreneurial universities vary between institutions and regional contexts, requiring adaptions in frameworks to address the specificities of each environment. Future research should explore how the strategic alignment between university goals (teaching, research, and outreach) and external demands (industry, government, and other stakeholders) affects success in promoting innovation and entrepreneurship. |
| | | Audretsch & Belitski (2022) | Strategic alignment at the individual, organizational, and systemic levels is crucial for generating entrepreneurial outcomes. Universities can lead innovation ecosystems by engaging public and private actors and facilitating collaboration and coordination among stakeholders (Quadruple Helix). | |
| Entrepreneurial Universities, Entrepreneurial Ecosystem | Critiques to the current entrepreneurial university model | Meek & Gianiodis (2023) | The Entrepreneurial University Model may favor elite universities and not address social costs and inequality appropriately. It is necessary to include a social component in entrepreneurial initiatives. | The model may not apply to all universities and contexts. A social component may reduce inequalities and benefit society more extensively. |

Literature on the entrepreneurial ecosystem (Table 4) highlights that understanding the role of universities in developing human capital, nurturing an entrepreneurial mindset, and promoting innovation, as well as support networks, are essential for improving the entrepreneurial ecosystem and its interaction with the community and other knowledge fields for regional, national, and global welfare. Besides considering the context and background of high-school students, it is important to assess the real impact of programs at elite and non-elite universities and to strengthen entrepreneurship support to enhance the performance and survival of startups within the university.

**Table 4.** Literature Review on Entrepreneurial ecosystem

| RELATED Topics | TOPIC | Author/Year | Main Findings | Implications for Future Research |
|---|---|---|---|---|
| Entrepreneurial Ecosystem, Entrepreneurial University | Entrepreneurial ecosystem mapping and entrepreneurial support | Isenberg (2011, 2016) | Mapping the entrepreneurial ecosystem helps understanding the role of universities and the entrepreneurship support network. | Universities are crucial for developing human capital, fostering entrepreneurial mindsets, and promoting innovation. Analyzing their role and that of support networks is essential for enhancing the entrepreneurial ecosystem and its interaction with the community, as well as understanding how they interact with other fields of knowledge for regional, national, and global welfare. |
| | | Spigel (2017) | Entrepreneurial ecosystems comprise cultural, social, and material attributes, provide resources to entrepreneurs, and affect the entrepreneurial process in several ways, depending on the regional context. | |
| | | Wurth et al. (2022) | Need for a broader understanding of entrepreneurial ecosystems, considering an interdisciplinary context and seeking to understand the causal mechanisms governing them, with an integrated view and practical applications. | |
| Entrepreneurial Ecosystem, Entrepreneurship Education | Correlation between university entrepreneurship education programs and entrepreneurship rates | Eesley & Lee (2021) | University programs may not increase entrepreneurship rates but rather enhance entrepreneurs' self-confidence and performance. | There is a need to consider the context and background of high-school students, evaluate the real impact of programs in both elite and non-elite universities, and strengthen entrepreneurship support to improve the performance and survival of academic startups. |

The clustering of topics and the implications of the integrative literature review help justify the need for a framework that provides a systemic view of entrepreneurship in universities. This framework integrates the role of entrepreneurship education in supporting students' entrepreneurial processes, particularly in raising awareness and entrepreneurial intention, and providing support to change intentions into actions. It considers the needs of industry and society and involves the development of entrepreneurial and innovation ecosystems built by students and faculty (bottom-up) and university leadership (top-down). The framework described below can provide knowledge and insights for scholars, educators, practitioners, university managers, and students involved in the teaching, practice, and research of entrepreneurship within universities.

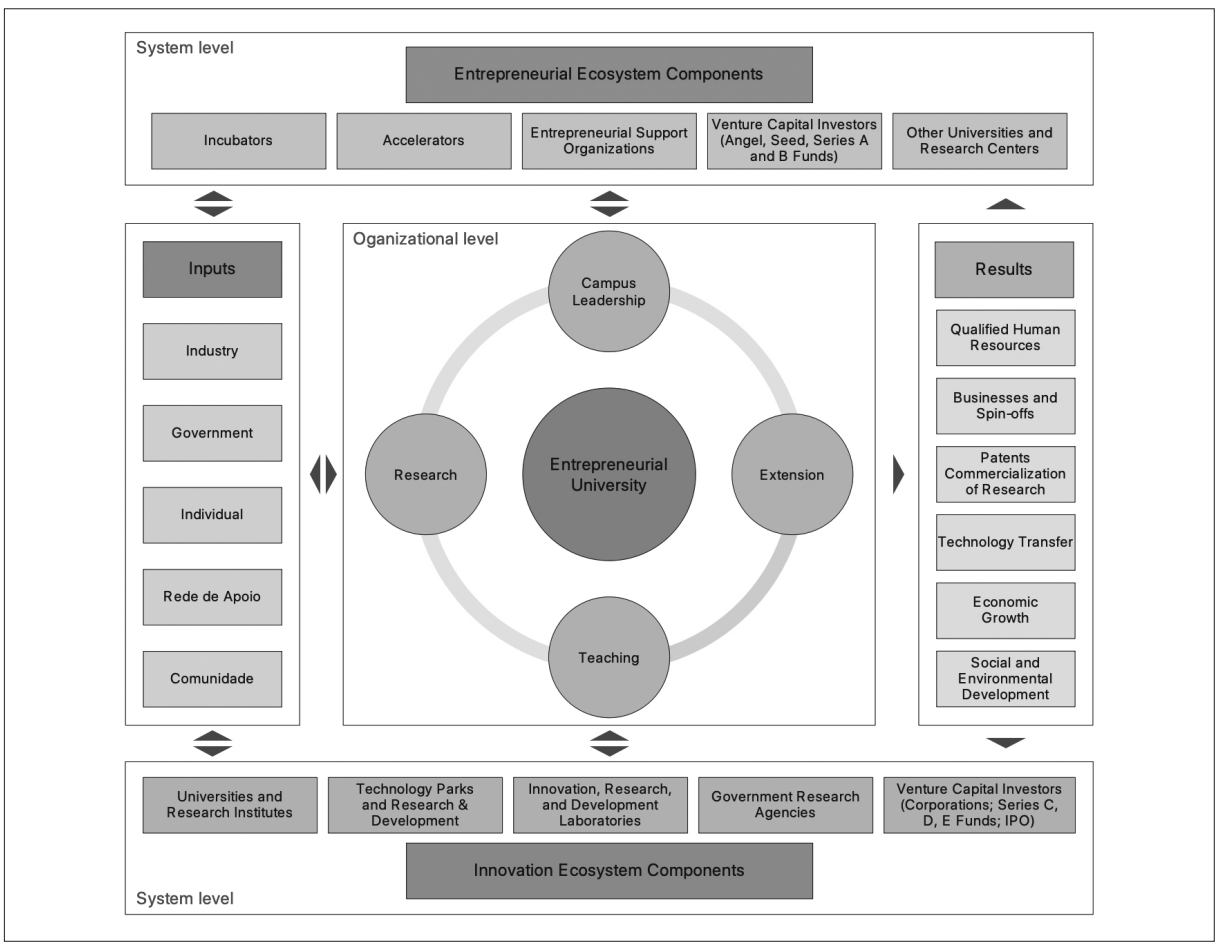
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## SUGGESTING A THEORETICAL FRAMEWORK FOR RESEARCH AND INNOVATION OPPORTUNITIES IN ENTREPRENEURSHIP EDUCATION

Our literature review did not find a framework that integrates the relationships between the university (campus leadership, teaching, research, and extension), Quadruple Helix stakeholders, and the involved ecosystems. Therefore, we acknowledge the urgency of connecting the various aspects of the entrepreneurial university.

We developed a framework divided into two stages: one macro, providing a map of the entrepreneurial university, and one micro, which examines the relationships between entrepreneurship education, support for entrepreneurship, and ecosystems. An Integrated Entrepreneurial University Framework (Figure 10) provides a map of the entrepreneurial experience with a broader perspective and considers inputs from the environment where the university is located; campus leadership, research, teaching, and extension; components of the entrepreneurial ecosystem and innovation ecosystem surrounding the university; and the achieved results.

**Figure 10.** Integrated Entrepreneurial University Framework



A Theoretical Framework Proposal for Research and Innovation Opportunities in Entrepreneurship Education (Figure 11) helps understand how the entrepreneurial process unfolds in a university setting, covering teaching methods, entrepreneurial practices, and student support for training and developing young entrepreneurs.

This framework, built from a literature review across four areas of study - entrepreneurship education, entrepreneurial university, entrepreneurial ecosystem, and entrepreneurial process - includes key elements that we highlight below, expecting to contribute to future research and generate practical implications for universities.

*Individual*. The entrepreneurial process begins at the individual level (students, professors, scientists) and involves understanding motivations, beliefs, background, repertoire, and context, as well as previous experience with entrepreneurship (Audretsch & Belitski, 2022; Maritz, 2017; Nabi et al., 2017).

*Culture*. The creation and promotion of an entrepreneurial culture should consider the context of the entrepreneurial ecosystem, including the regional environment where the university and individuals are embedded, and may be influenced by the dissemination of success (or failure) stories from other entrepreneurs, individual behaviors, social norms, and formal and informal incentives for the development of new entrepreneurs (Isenberg, 2011).

*Entrepreneurship Education*. The importance of considering the context and empowering student entrepreneurial action toward their career interests (Toscher, 2019) and a hybrid approach of entrepreneurship education for future research directions, balancing entrepreneurship, profession, and the general purpose of education (Ramsgaard & Blenker, 2021). This reinforces the need to consider and observe the context and specificities of entrepreneurship education in other areas, such as technology, arts, innovation, and other sectors, according to the research process. From the survey of the main entrepreneurship education methods, it was possible to identify the pedagogical and entrepreneurship methods (learning tools) universities use in entrepreneurship education programs. This included the analysis of emerging methodologies from the entrepreneurship field (customer development, lean startup, business modeling - business design, design thinking, games and dynamics, elevator pitch, equity negotiation, etc.), which are adopted together with traditional teaching methodologies (such as lectures, theoretical classes, textbooks, videos, mentoring, case studies, and lectures with successful entrepreneurs).

*Entrepreneurship support system*. The attributes (cultural, social, and material) of the entrepreneurial ecosystem (Spigel, 2017) contributed to deepening the analysis of the support network for entrepreneurship in the case study during and after students' graduation.

*Entrepreneurial university*. Entrepreneurial university frameworks previously described showed the importance of analyzing outcomes by considering external factors in academic and industrial contexts and internal factors within universities (Markuerkiaga et al., 2019). These factors can be formal and informal within the entrepreneurial university environment (Guerrero

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& Urbano, 2012) and take place at different levels: system, university, and individual (Audretsch & Belitski, 2022). Other relevant factors are the performance of entrepreneurial universities: dynamic capabilities to develop innovation ecosystems, including campus leadership and social development. Understanding the ecosystem's stage helps to identify the university's functions in different contexts.

*Entrepreneurial ecosystem.* Isenberg's (2011) diagram proposal for the entrepreneurial ecosystem contributed to understanding the role of entrepreneurship education in fostering and developing entrepreneurship. In our study, it assisted in the analysis of the entrepreneurship education teaching model and student support in the entrepreneurial process, including partnerships and external support provided by the university to students, resulting from partnerships with the entrepreneurial ecosystem where it is embedded.

*Financial.* Isenberg (2011) highlighted the importance of entrepreneurs' access to investments and funding when stimulated to become entrepreneurs. Here, we mention the university's role in attracting public and private investment for technology transfer, commercialization of science, knowledge, and new ventures.

*Market access.* Start-up businesses need customers and networks to advance their hypotheses, develop products, and attract investors.

*Human resources.* Both start-up entrepreneurs and researchers need a competent and skilled workforce to achieve their goals.

*Policies.* Knowing laws, public policies, incentives, and support institutions are key factors for developing entrepreneurial activities and innovation. Policymakers can contribute to fostering, investing, and supporting the development of better opportunities for new ventures, research, and technology transfer for the development of the industry, local economy, and society.

*Industry, market, and society.* This part of the framework highlights the importance of analyzing the results achieved for the industry, market, and society, including new ventures, technology transfer, spin-offs, economic growth, and social development.

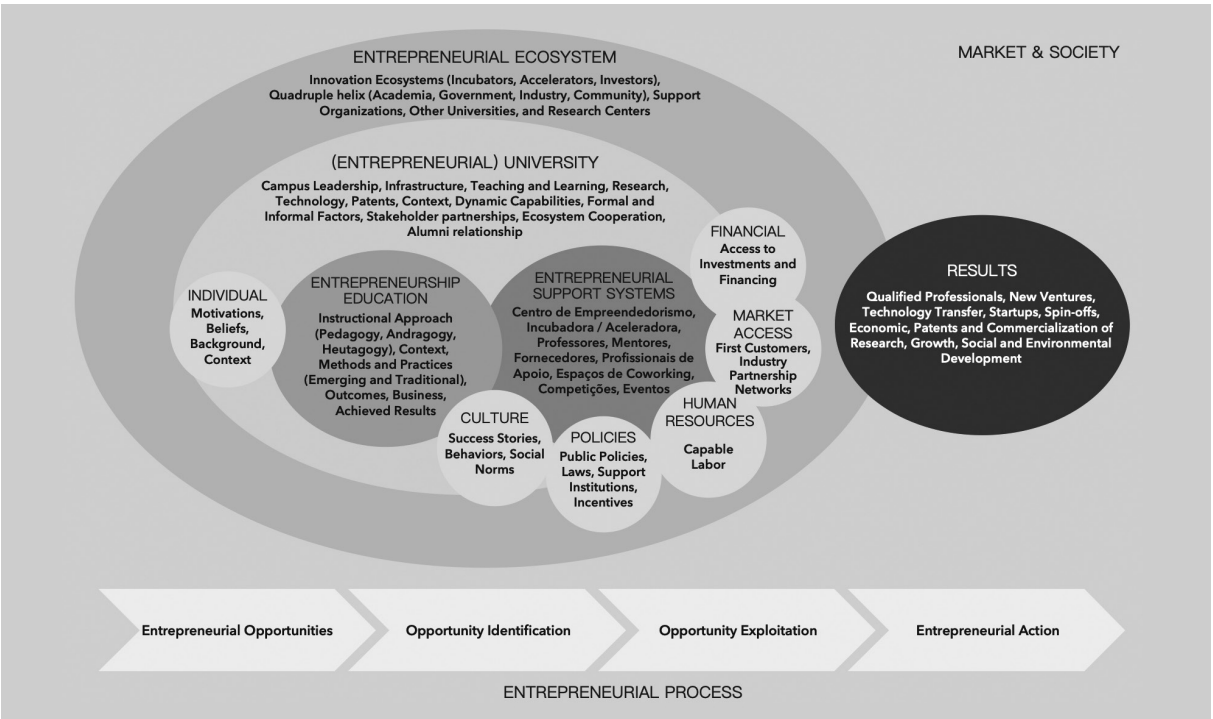
*Entrepreneurial process.* Understanding the entrepreneurial process and what happens between identifying an entrepreneurial opportunity and entrepreneurial execution can help universities, government, support systems, and other sectors take the necessary actions and provide what is needed to assist entrepreneurs in this process.

Therefore, based on a comprehensive literature review, our theoretical framework proposal (Figures 10 and 11) for exploring research and innovation opportunities in entrepreneurship emphasizes a crucial argument for investigating and interpreting entrepreneurship education outcomes within a contextual framework, considering individuals' motivations and backgrounds. We argue that teaching, practice in entrepreneurship, and entrepreneurship education research

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should be examined along with a supportive system contextualized and interconnected with the entrepreneurial university and the entrepreneurial ecosystem, which includes the student and the firm. Our framework suggests that the entrepreneurial process should be analyzed across each stage and context, enabling future research to explore how it unfolds in various settings (such as entrepreneurship education, entrepreneurship support, within a university environment, and its corresponding entrepreneurial ecosystem). Figure 9 summarizes this proposal, a potentially emergent approach.

**Figure 11.** Theoretical Framework Proposal for Research and Innovation Opportunities in Entrepreneurship Education




We recognize that both entrepreneurship research and teaching should not be disconnected from society's demands, support for university entrepreneurs, and the opportunities offered by the entrepreneurial ecosystem. The framework emphasizes the importance of integrating entrepreneurship education with market context and entrepreneurial support at the university by considering the entrepreneurial university context and opportunities, the relationships between different elements, such as public policies, institutional partnerships, and opportunities offered by the entrepreneurial ecosystem, thus providing a more comprehensive view of entrepreneurship education teaching and practice.

This framework includes key factors such as context, culture, educational methods, support systems, market access, investments, and human resources, which must be considered for future research on entrepreneurship and the development of entrepreneurial universities and innovation ecosystems.

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## CONCLUSIONS, LIMITATIONS, AND FUTURE RESEARCH

This paper presents a comprehensive theoretical framework for exploring innovation opportunities through qualitative and quantitative research on entrepreneurship education. This framework was grounded on a comprehensive literature review of entrepreneurship education, entrepreneurial university, entrepreneurial ecosystem, and entrepreneurial process. It emphasizes the importance of considering the context and the different dimensions involved in the entrepreneurial formation of university students. The framework presents a broader view of the entrepreneurial process in universities that goes beyond entrepreneurship education (awareness and teaching methods and practices) to include support for entrepreneurship (development for generating entrepreneurial results) and the entrepreneurial ecosystem (context and environment) where the university is located (or the innovation ecosystem developed especially for entrepreneurial universities). In addition, it provides managerial contributions for university leadership, aiming to consolidate efforts and resources for developing a more comprehensive entrepreneurship program within universities, extending beyond classes on entrepreneurship education.

Our framework provides insights for researchers, educators, university managers, professionals, and policymakers interested in the development of entrepreneurship and innovation. One of the main contributions is its integrated approach to entrepreneurship at universities, both from a pedagogical and research perspective, bringing together different areas like teaching, learning processes, partnerships with stakeholders, entrepreneurial ecosystem, and entrepreneurial process.

For future research, the main contribution of this framework is to provide a broader (holistic) and integrated view of the role and impact of entrepreneurship on universities and society. The main limitation is its novelty, as it has not yet been assessed and applied in empirical research. However, we expect it will contribute to new studies on the creation and development of entrepreneurial universities and innovation ecosystems.

For leaders of educational institutions and policymakers, our main contribution is to suggest a more integrated vision of entrepreneurship at universities in general, especially for those that have not yet become entrepreneurial universities or are in their early stages. Hence, they should consider entrepreneurship education integrated with support for new businesses, with the entrepreneurial process assisting students at each stage. We also understand that entrepreneurship education and support can be a slow process - entrepreneurship education is an initiative that can bring long-term results, as university students have a maturation time. Students need to learn entrepreneurship early, but the results will not often come quickly; in this sense, the framework can contribute to the demand for longitudinal studies. In practical terms, it sheds light on the establishment of entrepreneurial actions in universities by the leadership team (top-down), students, professors, researchers (bottom-up), and also stakeholders, for economic and social development.

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However, it is important to explain the limitations of this framework proposal. Although public policies, laws, and incentives related to entrepreneurship have been considered, it is necessary to expand the literature review. Specifically, it would be important to explore partnerships between universities and innovation labs, technological centers, and other institutions, both public and private. In addition, an aspect that deserves attention and further investigation is the literature review on access to investments for businesses that emerge at universities, including modes such as Bootstrapping, Crowdfunding, Angel Investors, Venture Capital Funds, Venture Building, and collaborations with large companies regarding technology transfer. Although these features of the entrepreneurial ecosystem were considered in the framework, it is imperative to highlight that existing literature may not cover all the details and complexities involved in these collaborations.

In brief, while this theoretical framework is comprehensive for exploring entrepreneurship education and entrepreneurial university, there are still gaps to be filled and aspects that require further analysis. We expect that future research can address these limitations, refine the theoretical framework proposal for research and innovation opportunities in entrepreneurship education, and contribute to advancing the concept of entrepreneurial university, considering the integration of teaching and support for academic entrepreneurs and the context of students and society.

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## CONFLICTS OF INTEREST

The authors have no conflicts of interest to declare.

## AUTHORS' CONTRIBUTION

Dario Vedana: Conceptualization; Data curation; Formal analysis; Investigation; Methodology; Project administration; Software; Validation; Visualization; Writing – original draft.

Tales Andreassi: Conceptualization; Formal analysis; funding acquisition; Methodology; Project administration; Resources; Supervision; Validation; Writing – proofreading, and editing.

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