

Universities at the Heart of attractive territories: a *Novum Trivium* formula in the era of energy consumption optimization

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Abstract. Today, it has become fruitless, reducing the role of the university to its sole mission of education. Undoubtedly, a university is a source of knowledge that acts as an incubator for creativity and innovation; however, more light should be shed on how universities help create a vibrant economy by providing employment opportunities, promoting high-quality research, and stimulating investment. In this work, we focus on displaying a new adaptable *trinity* formula that places the university, with all its missions, in the heart of an attractive territory. It is in this vein that we study the importance of well-choosing the remaining territorial components to be part of the trivium formula. The main aim of the current premise is to highlight the significance of adjusting territorial innovation models, such as business ecosystems of innovation and triple helix models of innovation, in accordance with the weight of keystone components of territory and how they participate in its attractiveness, all of which are orchestrated by universities. The importance of this topic lies in recognizing the potential of universities as accelerators for territorial advancement, including their role in achieving the Sustainable Development Goals, by acknowledging their many distinct contributions to fostering innovation and protecting the environment. Adopting the trivium formula means providing a blueprint that encourages fortifying links within a territory's components, thus enhancing relations between universities and other pieces of the territorial development puzzle we built this work upon as a method to understand innovative territories, from green innovation to industrial intelligence.

Index Terms— Business Ecosystems of Innovation, Territory, Territorial Attractiveness, Territorial Development, Triple Helix Model of Innovation, *Trivium* formula, University.

1 Introduction:

It is commonplace state that we live today in unpredictable environments where the truths of yesterday are not necessarily those of tomorrow. Still, not enough harsh circumstances seem to weaken both micro and macro-level ambitions of creating attractive territories and innovative regions.

One subject that appears to stimulate the discussion about territorial innovation creation is that of triple helix models [1], or the so-named triple helix of university-industry-government relations. Tendencies to use the helices metaphor in various research fields intrigued our appetite and enflamed our quest to further understand the concept in question. However, we admit that the above-named model is not the only backbone of this paper. A second metaphor known as the ecosystems of innovation made its way into our research, situating the study in an overlapping perspective.

Accordingly, we can agree that territories are unique regarding their components and how their links can eventually result in innovative strategies leading to development and attractiveness. The way to achieving such aims can and should differ from one region's reality to another. Yet, we chose to summarize our inspiration from the ex-ante work on the above-mentioned models, in a formula that puts a university at the heart of the territory and mandatorily links it to two of its most important components, to build a trivium formula. The main objective is to answer one core question: Can a university be at the heart of attractive territories?

To come close to answering that interrogation, we suggest gathering the pieces in this article via three successive phases: First, we will pencil out the main stones of an innovation business ecosystem and explicitly elucidate how it led us to line out the trivium formula starring universities. Second, we will present what interested and inspired this work, based on the triple helix of innovation. In the third and final section, we try to glue puzzle pieces together, fomenting an overview of key concepts and discussing our way through answering the aforementioned question before concluding the study.

2 Forgathering pieces: Method and results

In this work, we describe the method as a process of building a puzzle to solve one of the many riddles of territorial development, which is the ability of universities to be at the heart of territorial development. Unlike in a traditional puzzle game, we started off with a string of key pieces and strived to shape other forms until we reached the optimal result, in this case, the optimal formula (Fig. 1).

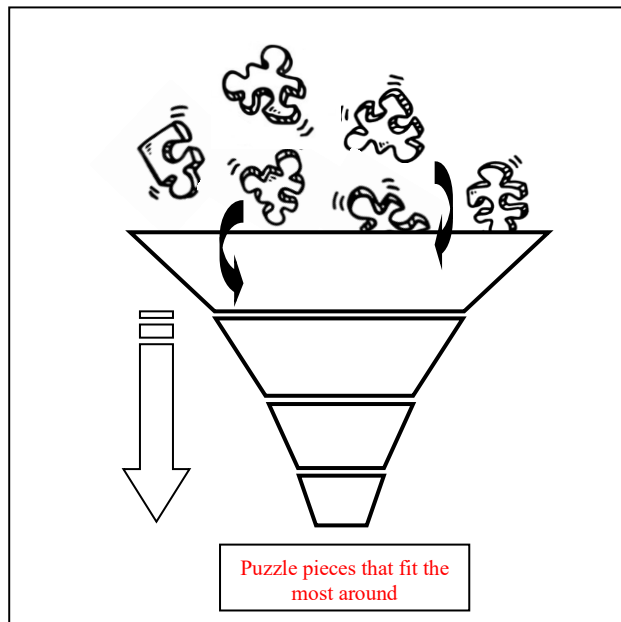


Figure 1: Forgathering puzzle pieces as a method to answer the research question.

Prior to putting together pieces of the aforementioned territorial attractiveness puzzle, thoughts about the right glue were on the radar. It is in this vein that we studied two models of territorial innovation in an attempt to comprehend the various dynamics that may exist around universities in a way that makes the trivium formula work.

2.1 The Business Ecosystem of innovation

Considered an expressive means to get messages through, metaphors seem to grow uninterruptedly in business-management research fields. The ecosystem's introduction to management goes back to 1993 when Moore explicitly founded the business ecosystem formula based on a biological analogy of natural ecosystems. Thenceforth, an array of ecosystems made their way through the hall of fame [2]; innovation ecosystems, entrepreneurial ecosystems, national ecosystems, digital ecosystems...

Nevertheless, in an attempt to screen the literature about innovation ecosystems, we faced what researchers now and then stumble upon, meaning a lack of generally accepted nomenclatures. As we perceive it, innovation ecosystems have not been thoroughly defined. Still, we attempted to report findings, leading clues, and *indicia* in hope of justifying the slight puzzlement we encountered.

Primo, in the opening of their paper, Z. Liu and al. (2019) [3] describe innovation ecosystems as a derived format of university-industry-government interactions in times of sharing economy, thus referring to their tight *liaison* to the triple helix model [1]. *Secondo*, Markkula, and Kune (2015) [4] argue that the entrepreneurial role played by the university as their third mission is held vital when it comes to preserving the effectiveness of an innovation ecosystem. Given these two points, we were skeptical about whether the triple helix and innovation ecosystems stand for similar models and whether these ecosystems are nothing but new bottles for old wine.

However, further investigations revealed a significant divergence between both concepts. A recent work of Yaghmaie and Vanhaverbeke (2019) [5] focuses on the role of an orchestrator within an innovation ecosystem. This keystone firm is supposed to be in charge of leading the value creation process, amongst other roles. Furthermore, a work by Schaeffer and al. (2018) [6] describes the cornerstones of an innovation ecosystem's activities as "collaborative arrangements between firms and local institutions, including universities, research institutes, technology transfer offices, sources of funding, and others". We read this description as tending to focus within an innovation ecosystem, on two helices: industrial institutions and universities.

To sum up, these two last contributions led us to consider aspects of dissimilarity when looking at innovation ecosystems and triple helix models without neglecting their common grounds, such as the significant role of the university in their survival. Yet, it was crucial, for the sake of the trivium formula, that we highlight what a triple helix model of innovation is about.

2.2 The triple helix model of Innovation

It was in a workshop in Amsterdam organized by Leydesdorff and Peter van den Besselaar in 1993 that the triple helix model for the dynamics of university-industry-government relations [1] was first born [7]. However, if the helices metaphor takes you too far on a throwback to the 1950s DNA structure, we invite you to bear in mind that a triple helix-shaped water screw was anciently invented as a form of agricultural innovation. It served as a water support system both in plain buildings and Hanging Gardens of Babylon, known as one of the ancient world's wonders [8].

As the model's pioneers, Etzkowitz and Leydesdorff (2000) [1] contend that relations between universities, governments, and industries are of no ceremoniously fresh appearance. In the same vein, they argue that, as the three spheres existed in *ex-ante* innovation models, the predominant nature of their links (if any) would characterize the government as the ultimate ruler of both industries and universities. In light of that, other authors, likewise, adumbrated the thesis of communications through and beyond institutional borders [9], perceiving the triple helix relationships as forms of coordination and communication between universities, government, and firms. One of many plausible translation scenarios is one in which academia and industry preserve the label of knowledge sources while government foments frameworks and promotes standards as in the rules of the game [3].

Speaking of previous innovation models, some literature [1] seems to concentrate on the emerging tenet of a triple helix contention around three stages. First, a "Triple Helix I" phase, putting nation states in the lead and in charge of directing industry-academia relations. Second, a model of "Triple Helix II" fortifies each helix's borderlines and sets the three arenas apart. Third, the model under study baptized "Triple Helix III" grants a new knowledge infrastructure by permitting and even encouraging overlapping and overlaying linkages between universities, industries, and governmental institutions.

Hitherto, what struck us most regarding triple helix research papers was the noteworthy palatable interest of authors in such a theme [18-19]. In fact, some took the model to another extent, treating a quadruple helix model and even going further with a quintuple perspective [10]. Meanwhile, the founding fathers displayed no opposition to the matter. In fact, Leydesdorff (2012) [7] argues that in order to explain complex developments, there cannot be any limitation to the three helices in the helix model. He further contends that an "N-tuple or an alphabet of 20+ helices can be envisioned". At this level, what came most to our attention was the question of purposes laying behind the utilization of the triple helix model configurations.

In terms of innovation creation, Brännback and al. [11] argue that the interactions between the three spheres of the model in the study are key to the contribution to the national and regional creation of wealth. Another objective of the model consists of achieving innovation-friendly environments, which are composed of university spin-offs and three-way initiatives between government laboratories, university institutions, and all types of firms [1].

On another note, the triple helix model is expected to promote regional cooperation, by introducing dynamic innovation ability to the equation of regional innovation systems [12]. In addition, and on an individual helix level, actors that commit to such innovation models tend to increase their chances of harvesting the future fruits of their efforts [13].

Furthermore, going through the literature on the trilateral interconnections within the three aforementioned helices leads us to the ethos of such a triangular innovation model: the role played by a university in the enhancement of regional innovation and, thus, regional economic growth [20].

This vision encompasses not only the institutional actors in question but also the entrepreneurial university [1] as a thriving concept alongside the triple helix model. Notwithstanding such a primary role in boosting regional innovation, few authors took the stage to criticize the model. For instance, Brännback and al. (2008) [11] contend that the model focuses on the system and overlooks its fundamental actors. On the other hand, Markkula and Kune (2015) [4] shed light on the inaccessibility of innovation in many countries, making triple helix partnerships a far-from-reach aim.

3 Universities leading a trivium formula: A discussion

In order to fairly balance their traditional academic mission with regional development purposes, universities can provide an affordable, available, and high-quality education that promotes the long-lasting success of students and creates, spreads, and applies knowledge for the development of not only the state but also nation and world. Imagine universities partnering effectively with regions by engaging in a relationship of trust, and facilitating the coming and going of various individuals and organizations, involving faculty in regional partnerships, and aligning their mission with engagement that extends beyond the local campus region [14-16].

Relatedly, we can only acknowledge the important role that innovation models play in developing territories. Nonetheless, the reality of each and every region or nation makes it mandatory to adapt and contextualize these models if they are to be effective. It is in this vein that we suggest a trivium formula made of three main components (with the possibility of enlargement to one or more elements). The leading role shall be played by the university in reflection of the missions it developed over the centuries. Then, two main ingredients are put in the formula to enhance the links between them and the university.

All in all, if the triple helix model aspires to innovation through university-industry-government relations, we propose to take into consideration the multifarious nature of a territory that is inspired by the composition of a business ecosystem model. It is at this level of the present work that we invite to intersect both models [15] to come up this time with a formula that encourages each territory to elect the most effective spheres within its composure. The criteria being that, when strategically put together with a university, all three elements bake innovative leading territories towards achieving SDGs [17] and attractiveness.

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