

Beyond the Triple Helix: The Rise of the Quadruple Helix and the Redefinition of the Social Mission of the University

Lynda Timoussarh¹, Alaeddine Bouzid²

¹ PhD student in Management Sciences, Human Resources Management, University of Mohamed Seddik Benyahia Jijel (Algeria).

Email: linda.timoussarh@univ-jjel.dz

² PhD student in Management sciences, Business Administration, University of Mohamed Seddik Benyahia Jijel (Algeria).

Email: alaeddine.bouzid@univ-jjel.dz

Received: 16/01/2022

Accepted: 02/09/2022

Published: 31/10/2022

Abstract

This paper investigates and dissects the changing social function of universities through the shift from the triple helix to the quadruple helix using a theoretical perspective that is based on a review of different literatures concerning two models. The study is significant as it adds to the body of academic literature on models of innovation and university's role in the knowledge economy. An analytical framework is also offered that enables public policy makers and university managers to formulate strategies that foster community engagement and sustainable development. This study utilized descriptive analysis of a systematic theoretical review of the peer reviewed literature on triple and quadruple helix models and the social university mission, and overlaid a comparative analysis of triple and quadruple helix. The study determined that the The quadruple helix model re-defines the role of the university, from that of a central institution in a market and/or profit logic to one of social responsibility and community engagement with the university. The quadruple helix also signifies a shift towards a more complete model of knowledge generation and transfer, placing the university in the context of society, rather than* as a secluded institution, and turning knowledge and innovation to serve the public welfare.

Keywords: triple helix, quadruple helix, social mission of university, social innovation.

Tob Regul Sci. TM 2022; 8(2): 987-1004

DOI : doi.org/10.18001/TRS.8.2.71

1. Introduction

Recent decennia have seen a transformation in the relation between university, society, economy and state. Universities do not simply continue to give scientific knowledge and create professional and academic skills, but also become instruments for achieving (Carayannis & Campbell, 2011) sustainable development, social justice, democratic engagement and the fostering of innovation. In line with this, the Etzkowitz & Leydesdorff (2000) developed the Triple Helix model, which captures an analytical perspective among the university, industry, government as seeks to decipher innovation and knowledge production processes.

In the wake of increasing societal and environmental threats as well as of pressures from democratic transitions, the triple helix model was transformed into a quadruple helix model (Quadruple Helix) by Carayannis and Campbell (2009, 2010) based upon the inclusion of civil society or the social users of knowledge as engage players in the system of innovation. This conceptual turnaround was pivotal and restated the social mission of the university as “social innovation.”

The study Problematic

Despite the widespread use of the triple helix model in the literature on innovation and economic development, it has faced increasing criticism for ignoring the social and democratic dimensions of innovation and knowledge production. This model has focused on economic and technological dimensions without paying sufficient attention to the social, cultural, and environmental values that determine the paths of sustainable development (Carayannis & Campbell, 2010). Based on the above, the central problem of the study can be summarized as follows:

How does the quadruple helix model redefine the social mission of the university? What mechanisms enable universities to integrate civil society as a strategic partner in knowledge production and innovation processes?

Several sub-questions branch out from this central issue, including:

- What are the shortcomings of the triple helix model that necessitated the development of the quadruple helix model?

- What are the most important fundamental differences between the triple helix and quadruple helix models in terms of the role of the university?

- What are the organizational and institutional challenges facing universities in adopting the quadruple helix model?

The study gap

Despite growing interest in the quadruple helix model in recent scientific literature, there remains a clear knowledge gap regarding its theoretical and practical impact on reshaping the social mission of universities. Most previous studies have focused on the technical and procedural aspects of the quadruple helix model, without delving into the conceptual and strategic implications of integrating civil society into the university innovation system (Leydesdorff, 2012).

Although the literature on the third mission of universities has mostly addressed this mission from a narrow economic perspective focused on technology transfer and collaboration with industry, ignoring the social, cultural, and civic dimensions highlighted by the quadruple helix model (Laredo, 2007). This study therefore aims to fill this gap by providing an analytical framework that links the evolution of innovation models to the redefinition of the social mission of the university.

The importance of the study

This research is important for the following theoretical and practical considerations among others:

Theoretical importance

The study helps to enrich the academic literature on innovation systems and the co-evolution of universities within the knowledge economy by offering a robust conceptualisation of the incorporation of the triple helix model into the quadruple helix model and the subsequent modification of university missions. It also elucidates how changes in innovation systems relate to the evolution of universities as institutionalized social actors.

Practical Importance

It furnishes an analytical tool with which policymakers and university administrators can potentially develop strategies to cultivate and sustain community engagement.

Social importance

Rethinking and extending the mission of universities to social responsibility and civic engagement is necessary, particularly when considering the mounting global issues of climate change, hunger, and inequality.

Study Objectives

In order to answer the study's problem statement and sub-questions, a set of objectives have been established that this study seeks to achieve:

- Tracking and analyzing the theoretical and conceptual development from the triple helix model to the quadruple helix, while identifying the knowledge bases that led to this shift.
- Track and analyze the theory and conceptual development from the triple helix model to the quadruple helix, while also determining the knowledge bases that forced it to change.
- Find out how Russian Revolution has contributed to the reorientation of the social mission of the university in the quadruple helix model.
- Identify the fourth party, civil society, in the university innovation system, as well as its mechanisms for effective inclusion.
- Investigate the organizational constraints and opportunities for universities during their transition to the quadruple helix model and suggest solutions.
- Present a theoretical framework that attempts to link innovation models and institutional transformation in universities, which can be used in future studies on the same topic.

Study Hypotheses

Based on the study's problem statement and sub-questions, the research hypotheses can be formulated as follows:

- The quadruple helix model represents a qualitative development from its predecessor, the triple helix model, as it reshapes the concept of knowledge production from an economic-technological logic to a social-democratic logic.
- The integration of civil society into the university innovation system expands the third mission of universities to include social responsibility, civic engagement, and sustainable development, in addition to technology transfer and industrial cooperation.
- An effective response to the quadruple helix model requires a profound institutional transformation in universities, including their organizational structures, prevailing academic culture, incentive systems, and governance mechanisms.
- The ability of universities to adopt the quadruple helix model varies according to national and regional contexts, as well as the nature of historical relationships between universities and local communities.

Study Methodology

This study relied on a descriptive analytical methodology based on a systematic theoretical review of published academic literature on triple and quadruple helix models and the third mission of universities. Conceptual analysis was also used to deduce the theoretical and conceptual dimensions of the quadruple helix model and its relationship to the social mission of the university, as well as comparative analysis to highlight the differences between the triple and quadruple helix models.

2. Theoretical and conceptual framework

2.1. Historical roots of the triple helix model

This biology of innovation had not stirred much interest in us until the 1990s, when for the first time, researchers raised serious doubts about the linearity of the traditional model of innovation. Contrary to this model's claim, innovation does not proceed in a straightforward line from the laboratory bench of an academic institute to the factory floor of an industrial enterprise. As was demonstrated by later studies, innovation is a complex process that manifests itself on several levels and dimensions and occurs precisely within the framework of dynamic networks of relationships between different types of institutional entrepreneurs.

Leydesdorff (Leydesdorff & Etzkowitz, 1998, 2010) argued that there is an urgent need for more than two dynamics to interact: market and economic dynamics and government dynamics. A third dynamic, represented by the university, could destabilize this system and restore balance rather than maintaining a stable system.

In this emerging theoretical context, Henry Etzkowitz and Leydesdorff (1995, 1996) presented the Triple Helix Model as a comprehensive analytical framework that allows for a deeper understanding of these complex dynamics and multilateral interactions that drive innovation. The model provides a knowledge base to help universities better coordinate with industry and government to develop innovative markets and make universities interactive partners in national innovation systems (Ferreira & Steenkamp, 2015). The model also refers to the relationship between the university, industry, and government, considering each of these elements as relatively equal units with interconnections and overlaps between them (Jibrán & Ben Ouda, 2021).

The model is constructed on the basic assumption that innovation within the knowledge economy results from the complex interaction and overlapping of three major institutional actors:

The university: as a producer of scientific knowledge and human competencies, and as a generator of new ideas and inventions. The university is responsible for knowledge production and, more importantly, basic research that serves as a theoretical base for innovation.

Industry: as a promoter of technological development and commercial dissemination of innovations, and as a funding source and applied expertise. Industry helps to transform the theoretical knowledge into something viable by taking it to the market.

Government:

As a regulator of relations between the parties, a source of policy and public funding, and a guarantor of the public interest. The government establishes the regulatory and policy framework that facilitates cooperation between universities and industry and achieves national social and economic goals (Etzkowitz & Leydesdorff, 1997).

The model assumes that these three parties do not operate separately, but rather overlap and interact in an integrated institutional system (Leydesdorff & Etzkowitz, 1996, 1998), where an overlay of communications occurs in which new ideas are generated and innovative projects take shape. Etzkowitz and Leydesdorff also emphasized that these interactions create a multi-level evolutionary dynamic that drives the knowledge economy (Etzkowitz & Leydesdorff, 2000).

2.2. The typical evolution from the triple helix to the quadruple helix with the addition of civil society as a fourth party

Despite the success of the triple helix model in explaining the dynamics of economic innovation, it has faced fundamental criticism for neglecting the social and civic dimensions of innovation processes (Carayannis & Campbell, 'Mode 3' and 'Quadruple Helix': Toward a 21st century fractal innovation ecosystem, 2009). The model, which partially overlaps with traditional economic models, focused on economic efficiency and technological competitiveness (Cooke P., 2005). It ignored crucial issues such as social justice, environmental sustainability, and democratic participation in guiding innovation trajectories (Carayannis, Barth, & Campbell, 2012).

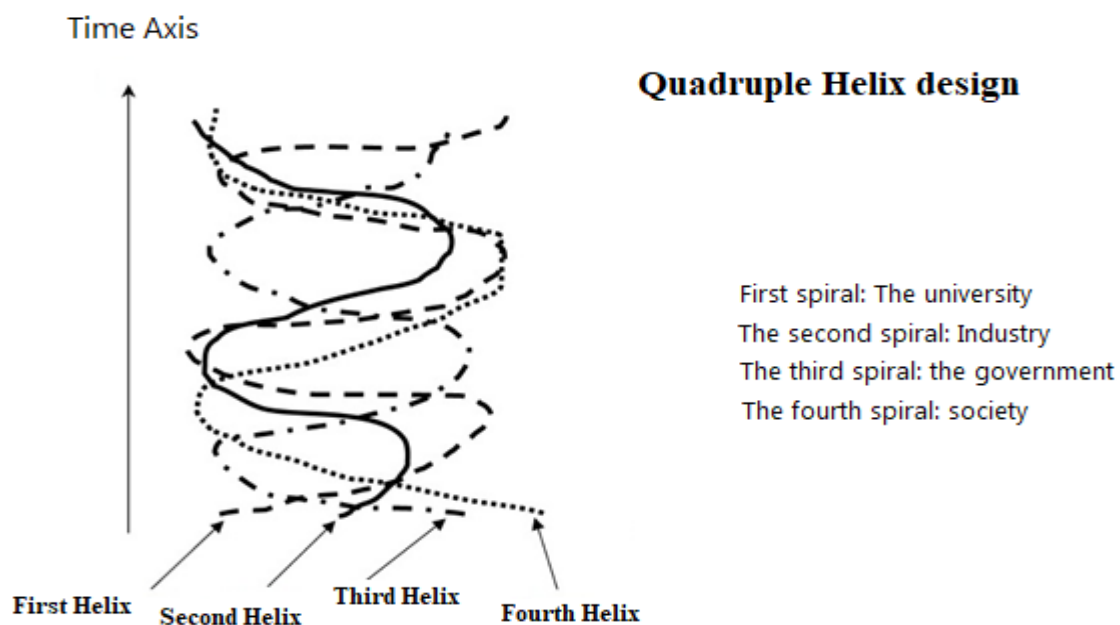
In this context, Carayannis & Campbell (2009) presented the quadruple helix model, which adds the general public as a fourth key player in the innovation system. where they depicted the Quadruple Helix model as a spiral with four strands, indicating in this context that the fourth dimension of the model means adding another strand to

the three spirals mentioned in the Triple Helix model, which they defined as: “the media-based and culture-based public” (Carayannis & Campbell, 2009, p. 206). According to the authors, this includes:

- **Media:** which shapes and conveys public opinion and collective consciousness.
- **Creative industries:** as part of the cultural system and as a driver of cultural innovation.
- **Culture, values, and lifestyles:** which influence the national innovation system.
- **Art:** as an influential cultural element.
- **The creative class:** as a fundamental element in shaping social reality, as defined by Florida in his seminal book (Florida, 2002), whose urban applications he later detailed (Florida, 2004).

According to Carayannis & Campbell (2009, p. 206), the fourth spiral is associated with “media,” “creative industries,” “culture,” “values,” “lifestyles,” “art,” and perhaps also the concept of the “creative class.” The interpretive potential of such a fourth spiral is, on the one hand, culture and values and, on the other hand, the way in which “public reality” is constructed and transmitted by the media, which ultimately affects every national innovation system. (Carayannis & Campbell, 2009).

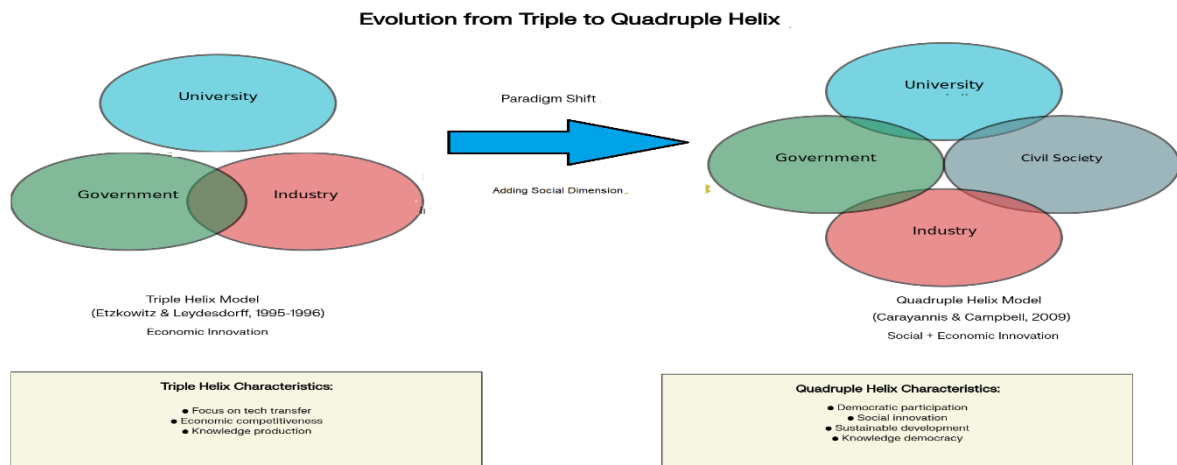
Figure 1: Design of the quadruple helix model (university, industry, government, society)



Source: Carayannis, E. G., & Campbell, D. F. (2009). ‘Mode 3’ and ‘Quadruple Helix’: toward a 21st century. *J. Technology Management*, p 207.

Figure 1 presents a conceptualization and visual design of the model, which contains four strands forming a quadruple helix. Each strand refers to: university, industry, government, and finally society. The model defines the conceptual perspectives through which the co-evolution and mutual integration of different knowledge modes can be addressed. The model emphasizes that sustainable innovation requires not only economic efficiency, but also social acceptance, democratic legitimacy, and environmental responsibility (Carayannis & Campbell, 2009, 2010). Thus, the transition from the triple helix to the quadruple helix represents a paradigm shift in understanding the nature of innovation and the responsibilities of institutional actors.

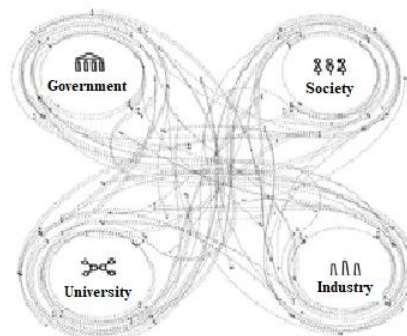
Figure 2: Typical transition from triple helix to quadruple helix



Source: Prepared by researchers based on a review of the literature Carayannis & Campbell (2009); Etzkowitz & Leydesdorff (1995, 1996)

The model was later adapted by Schütz, Heidingsfelder, & Schraudner (2019) to the helix proposed by Carayannis & Campbell (2009, p. 207), as shown in Figure 3. According to Schütz et al. (2019, p129), the model clearly depicts that the four components of the system (university, industry, government, and civil society) do not engage in one-way push-pull relationships, but rather in multi-layered, dynamic, two-way interactions, thus highlighting the role of civil society as a key actor in national innovation systems as well as the importance of effectively involving the public in innovation projects.

Figure 3: Quadruple helix model from above

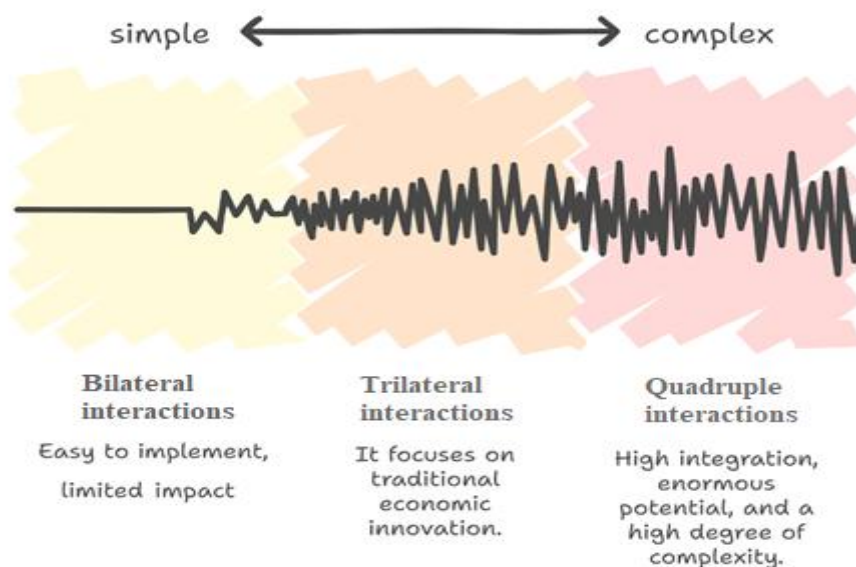


Source: Schütz, F., Heidingsfelder, M. L., & Schraudner, M. (2019). Co-shaping the futur in Quadruple Helix innovation systems: Uncovering public preferences toward participatory research and innovation. *She Ji: The Journal of Design, Economics, and Innovation*, 5(2), p129.

2.3. Multiple interactions in the quadruple helix model

The quadruple helix model is characterized by a complex network of interactions between the four parties. Mathematically, the number of possible bilateral interactions between four elements is six, while the number of trilateral interactions is four, and there is one quadrilateral interaction involving all parties (Leydesdorff, 2012). This complexity in relationships has created a rich dynamic but has also posed challenges in coordination and governance (Schütz, Heidingsfelder, & Schraudner, 2019).

Figure 4: Complexity in quadruple helix interactions

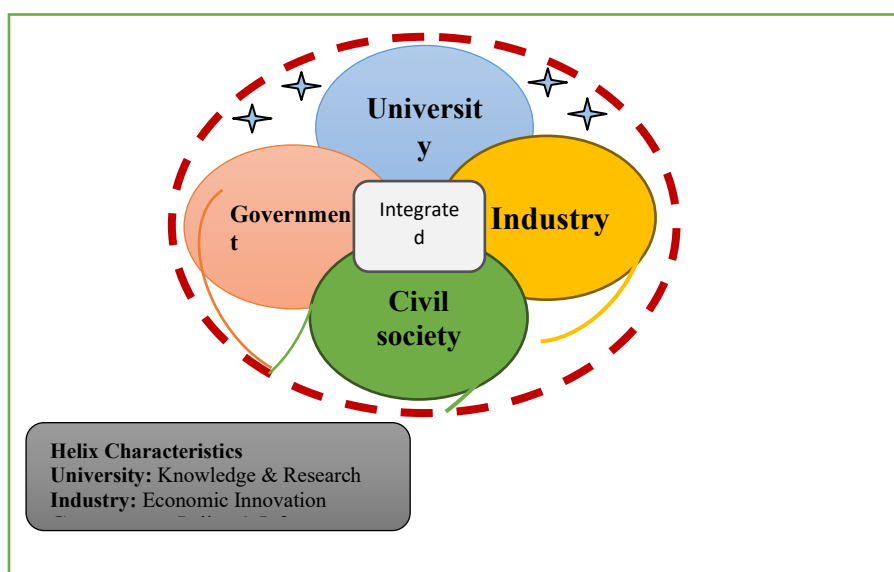


Source: Prepared by researchers based on a review of the literature (Leydesdorff, 2012; Schütz et al., 2019)

The following figure illustrates the quadruple helix model of integrated innovation, which brings together four key institutional actors: university (responsible for knowledge and scientific research), industry (producer of economic innovation), government (political and regulatory balance), and civil society (represented by social and cultural values). The fundamental role of this model extends beyond these four key players to include an expanded network of secondary actors (symbolized by stars), namely: civil society organizations (NGOs), the public and citizens, experts and specialists, supporting partners, and other advocates. The Integrated Innovation System reflects the dynamic and continuous interaction of all these actors. The dotted red line indicates the continuous and renewable innovation cycle, which produces three main outputs: economic growth, social development, and sustainable innovation.

This advanced model reflects the shift from an exclusive focus on economic efficiency to a comprehensive framework that balances economic, social, and environmental goals (Carayannis & Campbell, 2009, 2010; Leydesdorff & Etzkowitz, 1996; Benneworth & Cunha, 2015; Schütz et al., 2019; Goddard & Vallance, 2013; Morawska-Jancelewicz, 2022).

Figure 5: Quadruple helix model and interactions between university, industry, government, and civil society



Innovation Cycle

NGOs

Experts and specialists



The public and citizens

Other partners and supporter

Outcomes: Economic Growth + Social Development+ Sustainable Innovation

Source: Prepared by researchers based on a review of the literature Etzkowitz & Leydesdorff (1995, 1996); Carayannis & Campbell (2009)

Figure 6: Comparison of interactions within the quadruple helix model

	Bilateral interactions	Trilateral interactions	Quadruple interactions
Focus	The most common and easiest to implement, but with limited impact.	It represents the traditional triple helix, and focuses on economic innovation.	It represents the highest level of integration and offers tremendous potential for comprehensive and sustainable innovation, but it is the most complex to implement.
Parties involved	university-industry, or university-civil society	university-industry-government	university-industry-government-civil society
Complexity	Less complicated	More complex than binary interactions	The most complex
The effect	Limited	It focuses on economic innovation.	Huge potential for inclusive and sustainable innovation

Source: Prepared by researchers based on a review of the literature (Carayannis & Campbell, 2009; Leydesdorff, 2012; Schütz et al., 2019)

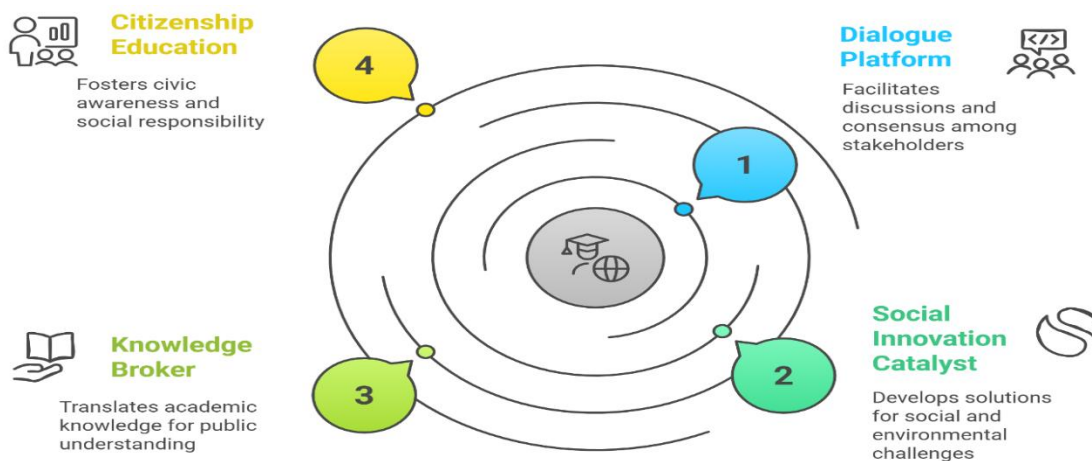
2.4. The university at the heart of transformation

The university occupies a very special place in the quadruple helix model. It is not just one player among others, but rather the center where everyone—industry, government, and society—comes together. What distinguishes the university in the model is that it does not speak only one language, but masters multiple languages: the language of science and research, the language of business and production, the language of politics and legislation, and the language of ordinary citizens and local communities. This advantage and position embody the ability to translate and mediate between different worlds, placing the university at the center of sustainable and inclusive innovation.

The most important functions of the university can be highlighted from the perspective of the quadruple helix model in the following points:

- **The university as a platform for dialogue:** bringing together different parties and providing a neutral space for discussion and consensus building (Bellandi, Donati, & Cataneo, 2021)
- **The university as a catalyst for social innovation:** where the university develops innovative solutions to social and environmental challenges (Morawska-Jancelewicz, 2021).
- **The university as a knowledge broker:** Translating academic knowledge into language that is understandable to the public and integrating local knowledge into scientific research (Benneworth & Cunha, 2015)
- **Citizenship education:** Fostering civic awareness and social responsibility among students (Ali, Mustapha, Osman, & Hassan, 2021)

Figure 7: The role of the university in the quadruple helix model



Source: Prepared by researchers based on a review of the literatures.

Figure 7 illustrates the multiple roles of the university in the quadruple helix model, emphasizing its evolving social mission beyond traditional economic innovation. The university acts as a platform for dialogue that facilitates discussions and consensus among diverse stakeholders (Carayannis & Campbell, 2010), while also serving as a catalyst for social innovation that develops solutions to pressing social and environmental challenges (Benneworth & Cunha, 2015; Schütz et al., 2019). In addition, universities act as knowledge brokers that translate academic knowledge into something the public can understand (Benneworth & Cunha, 2015; Schütz et al., 2019) and also promote citizenship education that fosters civic awareness and social responsibility (Goddard & Vallance, 2013). These integrated roles reflect the paradigm shift from the triple helix towards a more inclusive and socially responsive innovation system (Carayannis & Campbell, 2009, 2010; Morawska-Jancelewicz, 2022).

2.5. Knowledge Production Models: From Mode 1 to Mode 3

The paradigm shift from Mode 1 to Mode 3 is linked to the evolution of knowledge production models and contexts. We have moved from rigorous, specialized scientific research, where knowledge is produced according to internal standards without consideration for direct applications in Mode 1, to applied, participatory, multi-source, cross-disciplinary solutions that are subject to social accountability in Mode 2 (Gibbons, et al., 1994) and finally to Mode 3, which combines multiple disciplines and attempts to meet the needs of society through direct and multiple interactions with different groups and knowledge sources, emphasizing the role of knowledge-based democracy in guiding innovation processes. In this sense, knowledge production today has become more like an interwoven fabric, involving everyone who has an idea, experience, or issue, and expanding the impact of innovation to be a real shift in people's lives, not just isolated scientific achievements. The quadruple helix model is consistent with Mode 3, as it recognizes the plurality of knowledge sources and forms and emphasizes the need to democratize knowledge production processes.

3. Results and Analysis

3.1. Detailed Comparison Between the triple and quadruple Models

A comparative analysis of the triple and quadruple models reveals many fundamental differences between the two models on multiple levels, including their philosophy, values, cognitive logic, governance, and criteria for success. The following table illustrates these differences:

Table 1: Differences between triple and quadruple helix

Comparative Dimension	Triple Helix (University–Industry–Government)	Quadruple Helix (+ Civil Society/Media/Culture)
Philosophy and Values	Economic philosophy prioritizing efficiency, competitiveness, and growth; core value: technological innovation as the engine of economic development.	Socio-economic philosophy combining economic efficiency with social justice and environmental sustainability; core value: socially responsible innovation responding to community needs.
Epistemic Logic	Focus on marketable knowledge that can be converted into commercial products and services.	Also embraces civic knowledge and local knowledge that may not be marketable but are essential for solving societal problems.
Governance	Tends toward elite governance where experts and policy makers drive decisions with limited public participation.	Requires participatory, democratic governance engaging citizens and civil society in priority-setting and assessment.
Success Metrics	Economic indicators: patents, start-ups, technology-transfer revenues.	Adds social and environmental indicators: community impact, equity of benefit distribution, citizen satisfaction, environmental sustainability.

Source: Prepared by the researchers based on key theoretical studies on the triple and quadruple helix models and contemporary knowledge production frameworks: Ali et al. (2021), Benneworth and Cunha (2015), Breznitz and Feldman (2012), Carayannis and Campbell (2009, 2012), Geier and Hasager (2020), Goddard and Vallance (2013), Leydesdorff (2012), Morawska-Jancelewicz (2022), and Schütz et al. (2019).

3.2. Shapes resulting from interaction dynamics in the quadruple helix

The addition of civil society as a fourth party in the traditional triple helix alongside university-industry-government (the traditional triple helix model) has shifted the conceptualisation of innovation and knowledge production systems. This has facilitated emergence of new and complex dynamics leading to countless types of interaction and different kinds of results and effects.

The quadruple helix model developed by Karayannis and Campbell (2009) captures that innovation is not the outcome of isolated bilateral relations, but is entangled into a complex network of interactions on three distinct levels: the two-party level, the three-party level, and the four-party level. All these levels of interaction generate - specific types and forms of outputs which arise from various articulations in terms of nature of collaboration, participating parties, and social, economic and technological environments.

The table below is a complete map of these interactions their outcomes, where you will see how the system increments into complexity moving from bilateral partnerships through trilateral up to quadrilateral comprehensive initiatives. This model is crucial for analyzing the involvement of universities, governments, industries, and civil society in collaborative efforts to solve complex social problems and for advancing sustainable and inclusive systems of innovation. Understanding the mechanisms thereof through analyzing each mode of interaction and its products, somewhat the better potential for policy makers and practitioners and researchers to understand the mechanism how the processes of the collaborative innovation systems, and to better utilize the multi-stakeholder partnerships, in getting more meaningful impact in social, economics and environmental.

Table 2: Comprehensive Table of Interactions in the Quadruple Helix Model

Interaction Type	Interacting Actors	Interacting Actors
Bilateral	University ↔ Civil Society	community-based research, service learning, the transfer of public knowledge, consultations with communities
	University ↔ Industry	Transfer of technology, collaborations in research, patents and licensing

	Industry ↔ Government	Regulations, financial incentives, industry standards
	Government ↔ Civil Society	People's involvement in both governance and decision-making, integrated public policy and community dialogues
	University ↔ Government	Research funding, science and technology policy, priority research programmes
	Industry ↔ Civil Society	Corporate social responsibility, community sponsorship, joint initiatives
Trilateral	University ↔ Industry ↔ Government	Systems of national innovation, policy of technology development, R & D programmes financed by the government
	Industry ↔ Government ↔ Civil Society	Partnerships for the furtherance of sustainable development, the social economy, social enterprise, collective social responsibility
	University ↔ Government ↔ Civil Society	Socially relevant research, all-encompassing education policies, public service by way of education
	University ↔ Industry ↔ Civil Society	Inclusive innovation, vocational education and training, community-oriented research
Quadruple	All Four Actors	regional innovation platforms (collecting all regional players for joint work on specific challenges)
		Sustainable change strategies (strategies for the green economy)
		Smart cities programs (a combination of technology, governance, and citizenry)
		Responsible innovation systems (innovating in response to societal needs and ethical values)

Source:Prepared by the researchers based on a comprehensive review of the academic literature on the Quadruple Helix model. Bibri and Krogstie (2017), Bringle and Hatcher (1996), Carayannis and Campbell (2009, 2010, 2012), Defourny and Nyssens (2010), Etzkowitz and Leydesdorff (2000), and United Nations Environment Programme (2011).

3.3. Redefining the third mission of the university

The Quadruple Helix model marked a significant shift in understanding the “third mission” of universities: It expands the one-way transfer of knowledge to include multi-directional collaborative interaction between government, industry, university, and civil society/the cultural sphere (Carayannis & Campbell, 2009; 2012). In this framework, the university learns from the insights of civil society and local knowledge, and the logic of interaction in many initiatives shifts from a narrow marketing logic to one of civic engagement and institutional collaboration, which is addressed in the literature on social responsibility and community engagement of universities. Work on university social responsibility also supports the idea of expanding the role of the university from “provider of expertise” to “enabler” of communities (Esfijani, Hussain & Chang, 2012). Other researchers suggest that the criteria for measuring success should go beyond economic measures to include social, environmental, and cultural well-being (see Vallaeys' discussions on USR, 2014).

Figure8 :Expansion of the university mission within the Quadruple Helix framework



Source: Author’s elaboration based on Carayannis & Campbell (2009, 2012); Vallaeys(2014); and Esfijani, Hussain, & Chang (2012).

3.4. Challenges in implementing the quadruple helix model

The implementation of the quadruple helix model faces a complex set of challenges that hinder the transformation of universities towards genuine, multi-stakeholder partnerships with society. These challenges can be summarized in six main dimensions:

3.4.1 Structural and organizational challenges

The rigid organizational structures of most universities, with their continued focus on traditional disciplines and individual benefits, are among the most significant organizational challenges that hinder interdisciplinary collaboration and effective community engagement (Compagnucci & Spigarelli, 2020). The absence of specialized institutional mechanisms, such as community partnership coordination offices and social responsibility offices, contributes to an additional structural barrier to the implementation of the university's expanded third mission.

3.4.2. Cultural and value challenges

Traditional academic culture favors academic independence and research excellence over community engagement and participation, with applied specialized research and effective community participation considered less attractive and valuable than basic research. This reflects what is known as the “gap between academic culture and administrative culture” (Giuri, Munari, Scandura, & Toschi, 2019), which ultimately prevents researchers from accepting the importance of interacting with society.

3.4.3 Challenges related to incentive and promotion systems

Traditional academic promotion criteria focus on publishing in prestigious journals and attracting research funding (especially for basic research), without giving sufficient weight to community engagement and social innovation. This creates a significant gap between what the institution expects from researchers (community engagement) and what it actually rewards them for (academic publication alone). Furthermore, the absence of recognized mechanisms for recognizing and rewarding efforts in community service weakens individuals' motivation to engage in it (Frondizi, Fantauzzi, Colasanti, & Fiorani, 2019).

3.4.4. Resource challenges

Community engagement and social innovation require significant human and financial resources. With low and often indirect revenues, this further complicates matters and makes it extremely difficult to obtain sufficient resources. High financial pressures on universities—especially with declining government funding—are also pushing

academic institutions to focus on activities that generate significant revenue (such as paid educational programs and contract research), at the expense of their engagement in social responsibility activities (Compagnucci & Spigarelli, 2020).

3.4.5 Cognitive and communication challenges

In their study on the strategic orientation of universities in knowledge transfer activities, Giuri et al. (2019) point to the phenomenon of many researchers and academics in university institutions lacking the skills necessary to communicate effectively with different segments of society. The study attributes this partly to the barrier of technical academic language, which prevents the general public from understanding academic discourse, thereby reducing the effectiveness of knowledge transfer and innovation. Other studies have shown that this linguistic and cultural gap can be a major obstacle to genuine community participation and strong interaction between the university and society (Musesengwa & Chimbari, 2017).

3.4.6 Challenges of measurement, evaluation, and time horizon

The difficulty of measuring social, cultural, and environmental impact in an objective and accurate manner is one of the biggest challenges to promoting the third mission of the university. Unlike clear and measurable economic indicators (patents, start-ups, and industrial contracts), it is difficult to develop standardized and comparable indicators of social impact. Furthermore, real social impact can take years or even decades to emerge and be recognized, while stakeholders and funders pressure universities to deliver tangible results within a short time frame (Salomaa & Charles, 2021), creating a fundamental contradiction between the time required for real social change and the time allowed administratively, thereby undermining universities' investments in these long-term activities.

4. Critical discussion

4.1. Between the idealism and realism of the model

Despite the importance of the quadrant model, balanced criticism requires us to ask a fundamental question: to what extent does this model reflect concrete reality rather than idealistic perceptions and academic aspirations? In this context, Carayannis & Campbell (2009) argue that it is realistic to say that the model has dual value: it describes actual emerging trends in some contexts—particularly in Northern European countries—where universities have already begun to adopt multilateral cooperation structures (Carayannis & Campbell, 2009) ; but on the other hand, the model offers a normative and aspirational vision of what global innovation systems should strive for in light of growing societal and environmental challenges. However, this duality in itself raises important questions—between what is already a reality and what should be— in other words, between the contexts of the North and the distinct contexts of the Global South; between the theoretical ambition of the model and its practical possibilities.

4.2. The North-South divide

The ability of universities to adopt the quadruple helix model is strongly linked to differences in geographical and economic contexts (Perkmann, et al., 2013). In developed countries, where civil society is strong and organized, democracy is well established, resources are available, and trust between institutions is high, the model is easier to implement. In other contexts—whether in developing countries or in the geographical peripheries of developed countries —where civil society may face challenges, democracy is fragile, resources are limited, and trust is low—the model faces significant challenges. Therefore, the model must be adapted to local and contextual specificities, with the risk of “exploitation” and “ideologization”

Some critics warn that the quadruple helix model may be used to “ideologize” community participation, where universities appear to be socially engaged but without any real influence on power structures and resource distribution. Civil society may also be exploited to legitimize agendas predetermined by more powerful actors (government and corporations).

4.3. Tension between “independence” and “accountability”

The quadruple helix model creates tension between academic independence (which is a prerequisite for scientific excellence) and societal accountability (which is required by the model). How can universities be responsive to society without losing their independence? This question remains unresolved.

5. Recommendations

In light of the challenges discussed in the previous section of this study regarding the application of the quadruple helix model, as well as the gaps between the theoretical model and practical reality, this section presents a set of recommendations addressed to various stakeholders -universities, governments, policymakers, and civil society. These recommendations are based on documented literature and lessons learned from international experiences, and aim to improve the chances of effectively and sustainably applying the model.

5.1. For university institutions

5.1.1 At the strategic level

- Reformulate the mission of university institutions to explicitly include social responsibility and civic engagement as an essential part of the university's identity.

- Develop a comprehensive community engagement strategy that identifies priorities, programs, resources, and indicators.

- Recognize the multiplicity of stakeholders with the university, as it serves not only the government or industry, but also civil society, marginalized groups, and future generations.

5.1.2. At the organizational level

- Modify the organizational structures of university institutions and create the position of deputy director for community engagement with real authority, providing the necessary financial allocations and human resources.

- Establish community engagement offices or contact centers to coordinate and facilitate partnerships, and modify the scientific committees of colleges and institutes to include civil society representation.

- Build a database of expertise that links community needs with the expertise of faculty members.

- Create funding pools to support community initiatives, providing small grants to finance engagement projects.

5.1.3. At the academic level

- Review promotion criteria within university institutions to include community engagement as an officially recognized criterion.

- Develop service learning programs: in all disciplines.

- Encourage participatory research by providing training and methodological support.

5.1.4. At the cultural level

- Conduct internal awareness campaigns to correct negative perceptions of community engagement.

- Recognize and honor successful models of community engagement through awards and honors.

- Build capacity and competencies by training faculty members in community communication skills.

5.2. For policymakers

5.2.1. At the national level

a. Community engagement as a criterion for evaluating universities

Governments should reformulate University Performance Indicators to include community engagement indicators with sufficient weight and recognition alongside traditional indicators such as academic publishing and research (Wanjiru & Liu, 2021). These criteria should reflect the social, cultural, and environmental impact of the university, not just its economic output. In practical terms, comprehensive evaluation frameworks can be used that focus on three key areas: Purpose, which clarifies the goals and rationale for engagement; Process, which describes how to interact and partner with the community; and Community Impacts, which measures the real benefits to the communities involved (Wanjiru & Liu, 2021). Including these criteria in national quality assessments sends a strong signal to universities that community engagement is not optional but a fundamental institutional commitment.

b. Adequate and sustainable funding

Governments should establish dedicated national funding programs to support universities' community engagement initiatives, rather than relying on self-funding from universities (Salomaa & Charles, 2021). This funding can take several forms: Direct grants for community projects, or grant programs for applied research focused on local issues. This is particularly necessary in less developed countries, where resources are limited and institutional capacities are weaker. Sustainable funding ensures the continuity of partnerships rather than their discontinuity and contributes to building long-term trust between the university and the community.

c. Legal framework

Governments should develop a legal framework that facilitates multi-sectoral partnerships and protects the rights of all parties (universities, companies, local governments, and civil society). This includes: Simplifying contracting procedures between universities and community partners, clarifying responsibilities and obligations, and providing legal protection for shared data and intellectual property. Emphasizing the need for the framework to recognize local and experiential knowledge as valuable in comparison to academic knowledge, thereby legitimizing the bidirectional knowledge exchange model that is at the heart of the quadruple helix model.

5.2.2. At the national level

a. Establish platforms for dialogue and interaction

It is recommended that National Multi-Stakeholder Platforms be established, bringing together universities, small and medium-sized enterprises, local governments, civil society, and non-profit organizations. These platforms provide an opportunity for regular interaction and open dialogue between different actors, and facilitate the identification of common regional priorities and work on joint projects. These platforms are essential for implementing the quadruple helix model at the regional level, as they provide the institutional structure that brings together the four dimensions (university, industry, government, and civil society) (Carayannis & Campbell, 2009). They also contribute to reducing regional imbalances and responding to the needs of peripheral and disadvantaged areas.

b. Formulating national strategies for innovation development

Governments should develop National Innovation Strategies that explicitly adopt the quadruple helix model as a framework, as an alternative to traditional models that focus on the triple helix (university, industry, and government). These strategies should include civil society and social organizations as key actors (Cooke, Heidenreich, & Braczyk, 2004). This means redirecting regional resources towards inclusive innovation projects that address pressing social and environmental challenges, not just economic growth. The strategy must also include clear mechanisms for measuring social and environmental impact beyond traditional economic metrics (Wanjiru & Liu, 2021), ensuring genuine accountability to stakeholders.

5.3. For civil society

Civil society organizations are advised to implement capacity-building programs aimed at developing the skills necessary for effective participation in research and scientific dialogue with universities and other partners (Mezzalama, 2002). These organizations should also form coalitions and alliances among themselves to increase their collective impact when interacting with academic and administrative institutions (Brinkerhoff, 2003). Furthermore, since 2017, the reports and practices of the International Budget Partnership (IBP) have emphasized the importance of supporting community advocacy and lobbying to promote accountability in public institutions, including universities. In this regard, the IBP Annual Report 2017 refers to community participation, oversight, and facilitating public understanding of oversight reports to promote accountability and ensure compliance with social duties.

6. Conclusion

The rise of the quadruple helix model represents a historic turning point in redefining the social mission of universities. Universities are no longer ivory towers isolated from society, but have become strategic actors in addressing complex societal challenges, through partnerships with the other elements of the model: industry, government, and civil society.

This transformation requires a radical rethinking of the role of the university, moving beyond the narrow economic concept of the third mission to include social responsibility, civic engagement, and sustainable development. Despite the various structural, organizational, cultural, and knowledge challenges, as well as financial resource challenges, that the implementation of the quadruple helix model faces, it offers significant opportunities, from enhancing the social legitimacy of universities to enriching scientific research and contributing effectively to the achievement of sustainable development goals.

The concept of “beyond the triple helix” is not merely a physical addition of a fourth party to the model, but rather an attempt to comprehensively rebuild the innovation system so that it becomes more democratic, more responsive to societal needs, and more committed to sustainable development. At the heart of this new system, universities play a pivotal role as bridges connecting knowledge and work, university and society, and the present and the future.

5. References

- [1] Ali, M., Mustapha, I., Osman, S., & Hassan, U. (2021). University social responsibility: A review of conceptual evolution and its thematic analysis. *Journal of Cleaner Production*, 286(124931). doi:https://doi.org/10.1016/j.jclepro.2020.124931
- [2] Bellandi, M., Donati, L., & Cataneo, A. (2021). Social innovation governance and the role of universities: Cases of quadruple helix partnerships in Italy. *Technological Forecasting and Social Change*, 164(2). doi:10.1016/j.techfore.2020.120518
- [3] Benneworth, P., & Cunha, J. (2015). Universities' contributions to social innovation: reflections in theory & practice. *European Journal of Innovation Management*, 18(4), 508-527. doi:10.1108/EJIM-10-2013-0099
- [4] Bibri, S., & Krogstie, J. (2017). Smart sustainable cities of the future: An extensive interdisciplinary literature review. *Sustainable Cities and Society*, 31, 183-212. doi:https://doi.org/10.1016/j.scs.2017.02.016
- [5] Breznitz, S., & Feldman, M. (2012). The engaged university. *The Journal of Technology Transfer*, 37, 139–157. doi:https://doi.org/10.1007/s10961-010-9183-6
- [6] Bringle, R., & Hatcher, J. (1996). Implementing Service Learning in Higher Education. *The Journal of Higher Education*, 67(2), 221-239.
- [7] Brinkerhoff, J. (2003). Government–nonprofit partnership: a defining framework. *public administration and development*, 23(1), 5–30. doi:10.1002/pad.203
- [8] Carayannis, E. G., & Campbell, D. F. (2009). ‘Mode 3’ and ‘Quadruple Helix’: toward a 21st century. *J. Technology Management*, 201-234.
- [9] Carayannis, E., & Campbell, D. (2009). 'Mode 3' and 'Quadruple Helix': Toward a 21st century fractal innovation ecosystem. *International Journal of Technology Management*, 46(3-4), 201-234. doi:10.1504/IJTM.2009.023374
- [10] Carayannis, E., & Campbell, D. (2010). Triple Helix, Quadruple Helix and Quintuple Helix and How Do Knowledge, Innovation and the Environment Relate To Each Other? *International Journal of Social Ecology and Sustainable Development*, 1(1), 41-69. doi:10.4018/jsesd.2010010105
- [11] Carayannis, E., & Campbell, D. (2011). Open Innovation Diplomacy and a 21st Century Fractal Research, Education and Innovation (FREIE) Ecosystem: Building on the Quadruple and Quintuple Helix Innovation Concepts and the “Mode 3” Knowledge Production System. *Journal of the Knowledge Economy*, 2(3), 327-372. doi:10.1007/s13132-011-0058-3
- [12] Carayannis, E., Barth, T., & Campbell, D. (2012). The Quintuple Helix innovation model: global warming as a challenge and driver for innovation. *Journal of Innovation and Entrepreneurship*, 1(1). doi:10.1186/2192-5372-1-2
- [13] Clark, B. (1998). *Creating Entrepreneurial Universities: Organizational Pathways of Transformation*. Paris and Oxford: IAU Press and Pergamon Press.

- [14] Compagnucci, L., & Spigarelli, F. (2020). The Third Mission of the university: A systematic literature review on potentials and constraints. *Technological Forecasting and Social Change*, 161(120284). doi:<https://doi.org/10.1016/j.techfore.2020.120284>
- [15] Cooke, P. (2005). Regionally asymmetric knowledge capabilities and open innovation: Exploring ‘Globalisation 2’—A new model of industry organisation. *Research Policy*, 34(8), 1128-1149. doi:<https://doi.org/10.1016/j.respol.2004.12.005>
- [16] Cooke, P., Heidenreich, M., & Braczyk, H.-J. (2004). *Regional Innovation Systems: The Role of Governance in a Globalised World* (2nd ed.). London : Routledge.
- [17] Defourny, J., & Nyssens, M. (2010). *Conceptions of social enterprise and related phenomena: Towards an ICSEM research agenda*. Liège: EMES European Research Network.
- [18] Esfijani, A., Hussain, F., & Chang, E. (2012). An Approach to University Social Responsibility Ontology Development Through Text Analyses. *5th Interantional Conference on Human System Interactions- HSI 2012*. Piscataway, NJ: IEEE. doi:10.1109/HSI.2012.10
- [19] Etzkowitz, H., & Leydesdorff, L. (1997). *Universities and the Global Knowledge Economy: A Triple Helix of University-Industry Relations*. London: Pinter Publishers.
- [20] Etzkowitz, H., & Leydesdorff, L. (2000). The Dynamics of Innovation: From National Systems and “Mode 2” to a Triple Helix of University–Industry–Government Relations. *Research Policy*, 29(2), 109-123. doi:10.1016/S0048-7333(99)00055-4
- [21] Ferreira, E., & Steenkamp, R. (2015). The exploration of The Triple Helix concept in terms of entrepreneurial universities and corporate innovation. *Corporate Ownership & Control*, 12(2), 491-506. doi:10.22495/cocv12i2c4p9
- [22] Florida, R. (2002). *he rise of the creative class: And how it's transforming work, leisure, community and everyday life*. New York: Basic Books.
- [23] Florida, R. (2004). *The Rise of the Creative Class: And How It's Transforming Work, Leisure, Community, and Everyday Life* (Rev. ed.). New York: Basic Books.
- [24] Frondizi, R., Fantauzzi, C., Colasanti, N., & Fiorani, G. (2019). The Evaluation of Universities’ Third Mission and Intellectual Capital: Theoretical Analysis and Application to Italy. *Sustainability*, 11(12). doi:<https://doi.org/10.3390/su11123455>
- [25] Geier, I., & Hasager, U. (2020). Do Service Learning and Active-Citizenship Learning Support Our Students to Live a Culture of Democracy? *Frontiers in Education*, 5(606326). doi:<https://doi.org/10.3389/educ.2020.606326>
- [26] Gibbons, M., Limoges, C., Nowotny, H., Schwartzman, S., Scott, P., & Trow, M. (1994). *The New Production of Knowledge: The Dynamics of Science and Research in Contemporary Societies*. London : SAGE.
- [27] Giuri, P., Munari, F., Scandura, A., & Toschi, L. (2019). The strategic orientation of universities in knowledge transfer activities. *Technological Forecasting and Social Change*, 138, 261-278. doi:<https://doi.org/10.1016/j.techfore.2018.09.030>
- [28] Goddard, J., & Vallance, P. (2013). *The University and the City*. London: Routledge.
- [29] Jibrán, S., & Ben Ouda, M. (2021). Analyzing the structure of the knowledge-based economy: Triple and quadruple helix perspectives. *Academy Journal for Research in Social Sciences*, 42-66.
- [30] Laredo, P. (2007). Revisiting the Third Mission of Universities: Toward a Renewed Categorization of University Activities? *Higher Education Policy*, 20(4), 441-456.
- [31] Leydesdorff, L. (2010). The Knowledge-Based Economy and the Triple Helix Model. *Annual Review of Information Science and Technology*, 44(11), 365-417. doi:10.1002/aris.2010.1440440116
- [32] Leydesdorff, L. (2012). The Triple Helix, Quadruple Helix, ..., and an N-Tuple of Helices: Explanatory Models for Analyzing the Knowledge-Based Economy? *Journal of the Knowledge Economy*, 3(1), 25–35. doi:10.1007/s13132-011-0049-4

- [33] Leydesdorff, L., & Etzkowitz, H. (1998). The Triple Helix as a model for innovation studies. *Science and Public Policy*, 25(3), 195-203.
- [34] Leydesdorff, L., & Etzkowitz, H. (1996). Emergence of a Triple Helix of university—industry—government relations. *Science and Public Policy*, 23(5), 279–286. doi:<https://doi.org/10.1093/spp/23.5.279>
- [35] Mezzalama, F. (2002). *Involvement of civil society organizations: enhancing partnership and participation in the United Nations system*. Geneva: Joint Inspection Unit, United Nations.
- [36] Morawska-Jancelewicz, J. (2021). The Role of Universities in Social Innovation Within Quadruple/Quintuple Helix Model: Practical Implications from Polish Experience. *Journal of the Knowledge Economy*, 13, 2230-2271. doi:<https://doi.org/10.1007/s13132-021-00804-y>
- [37] Musesengwa, R., & Chimbari, M. (2017). Community engagement practices in Southern Africa: Review and thematic synthesis of studies done in Botswana, Zimbabwe and South Africa. *Acta Tropica*, 175, 20–30. doi:<https://doi.org/10.1016/j.actatropica.2016.03.021>
- [38] Perkmann, M., Tartari, V., McKelvey, M., Autio, E., Broström, A., D'Este, P., . . . Sobrero, M. (2013). Academic Engagement and Commercialisation A Review of the Literature on University–Industry Relations. *Research Policy*, 42(2), 423-442. doi: <https://doi.org/10.1016/j.respol.2012.09.007>
- [39] Salomaa, M., & Charles, D. (2021). The university third mission and the European Structural Funds in peripheral regions: Insights from Finland. *Science and Public Policy*, 48(3), 253-363. doi:<https://doi.org/10.1093/scipol/scab003>
- [40] Schütz, F., Heidingsfelder, M., & Schraudner, M. (2019). Co-shaping the Future in Quadruple Helix Innovation Systems: Uncovering Public Preferences toward Participatory Research and Innovation. *She Ji The Journal of Design Economics and Innovation*, 5(2), 128-146. doi:10.1016/j.sheji.2019.04.002
- [41] Vallaeys, F. (2014). University Social Responsibility: a mature and responsible definition. In G. U. (Ed.), *Higher Education in the World 5: Knowledge, Engagement and Higher Education — Contributing to Social Change* (Vol. 48, pp. 88-96). Barcelona: Palgrave Macmillan / GUNi. doi:10.13140/2.1.2121.1523
- [42] Wanjiru, I., & Liu, X. (2021). Evaluating University-Community Engagement Through a Community-Based Lens: What Indicators Are Suitable? *Journal of Higher Education Outreach and Engagement*, 25(4), 133-152.