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An analysis of the disconnection between Universities and the Triple Helix Innovation System

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Abstract :
While the Triple Helix framework is a cornerstone of innovation research in developed economies, its integration within developing nations remains limited, primarily due to the complexities of field implementation. The evolution of this concept has fundamentally expanded the university's mandate; beyond its traditional focus on teaching and research, the modern university has emerged as a critical catalyst for technological progress and systemic change. This article examines the strategic synergy between academia, government, and industry—the three pillars of the Triple Helix. By analyzing the unique functions of each 'spiral,' we argue that the state must design economic policies that not only stimulate industrial growth but also facilitate the transition of academic research into market-ready products and new ventures. Ultimately, the effective execution of these policies hinges on the robust application of the Triple Helix model.
Keywords: Model of triple helix, innovation, The field of science and technology
Jel Classification Codes: O31, O32, I23

Introduction :

The Triple Helix model, first conceptualized by Henry Etzkowitz and Loet Leydesdorff in the mid-1990s, represents a fundamental shift in how we understand the 'knowledge economy.' Traditionally, the roles of the state, the industry, and the university were seen as separate and distinct. However, the Triple Helix suggests that these three spheres are increasingly overlapping.
In this model, the university is no longer just a place for teaching; it becomes an 'Entrepreneurial University' that generates new technology. Industry acts as the locus of production, while the government provides the regulatory stability and financial incentives to ensure the system thrives. Unlike older, top-down models, the Triple Helix is dynamic, the 'spirals' are constantly interacting, creating a spiral of innovation that is far more powerful than any single institution working in isolation.

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There is a broad consensus that innovation is no longer optional; it is a vital necessity for navigating today's volatile landscape. Faced with fierce competition, organizations are often forced into reactive, short-term strategies just to keep pace with environmental complexity. As economic theorists have long argued, innovation serves as both the primary engine of economic growth (Uzunidis, 2004) and a decisive factor in global competitiveness (Buesa et al., 2010).
Consequently, innovation has become a cornerstone of national welfare and a prerequisite for securing a market advantage. In an era where simply joining a market or cutting costs is insufficient, true success demands a more sophisticated approach—leveraging both internal and external innovation. While the roots of industrial dynamics can be traced back to Adam Smith, it was Joseph Schumpeter who revolutionized the field. By introducing 'creative destruction,' Schumpeter highlighted how entrepreneurs disrupt the status quo to drive development (Zouikri, 2008). Furthermore, a nation's innovative capacity is deeply anchored in its institutional fabric. From education systems to legal frameworks, the state plays a pivotal role whether through direct incentives like grants and tax breaks or by fostering collaborative networks between the public and private sectors (Rahmouni, 2011). Ultimately, for developing nations especially, this ecosystem must transcend purely technical activities to integrate universities and research centers into a cohesive strategy for national economic growth.

While numerous studies have established that a National Innovation System (NIS) is fundamental to institutional growth—particularly through robust intellectual property frameworks (Elche-Hotelano, 2011)—the concept is not without its critics. Some scholars argue that the NIS remains a somewhat ambiguous framework, often failing to account for state-specific nuances or the practical mechanics of its operation. A primary concern is the lack of 'feedback loops' between various institutional structures, a disconnect that can stifle the entire innovation process.

This study aims to address this academic gap by exploring complementary frameworks that facilitate the production of knowledge and technology, most notably the Triple Helix model. By shifting the focus toward this multi-layered synergy, we seek to answer the following core questions:

- To what extent does the Triple Helix model enhance the innovative capacity of organizations and institutions?
- How is the Triple Helix concept defined in a modern context, and specifically, what is the evolving role of the university within this three-way partnership?

2/ Study Literature:

2/1 General Concepts of Innovation

Despite a multitude of perspectives, a single, universally accepted definition of innovation remains elusive. The concept was pioneered by Joseph Schumpeter, who characterized innovation as the fundamental engine of economic development. He identified five distinct forms of innovation (Vyas, 2009, as cited in Atalay et al., 2013, p. 227):

- The introduction of new products or qualitative enhancements to existing ones;
- The implementation of novel production processes;
- The opening of new markets;
- The discovery of new sources for raw materials or inputs;
- The creation of new industrial organizational structures.

Building on this foundation, Peter Drucker described innovation as an organization's deliberate 'abandonment of the old,' reinforcing Schumpeter's iconic theory of 'creative destruction' (Najm, 2003, p. 21). This evolution is also reflected in the *Oslo Manual* (3rd edition), which defines innovation as the implementation of a new or significantly improved product, process, marketing method, or organizational practice within business operations (OECD, 2005, pp. 34-35).

While early literature largely adhered to Schumpeter's five-fold classification, more recent scholarship often distinguishes between radical and incremental innovation (Atalay et al., 2013, p. 222). Because innovation is both qualitative and quantitative, measuring it remains a complex challenge. To address this, research typically categorizes innovation activities into two streams: inputs, such as R and D expenditure, specialized workforce, and scientific publications; and outputs, including patents, the number of new products launched, and the resulting revenue (Zouikri, 2008, pp. 34-38).

2/2 The Triple Helix Innovation Model:

The Triple Helix is both an analytical and normative framework, emerging from the evolving role of the state within academic and industrial circles across different societies. At its core, the synergy between universities, industry, and government—acting as relatively independent yet deeply interconnected institutional spheres—is essential for fostering innovation and sustainable development in a knowledge-based economy (Dzisah & Etzkowitz, 2008, p. 102). This collaboration allows organizations to build integrated capabilities to solve complex technological challenges. Furthermore, the model thrives on feedback loops generated by the interaction between economic, social, and political spheres, which in turn drive the dissemination of learning and innovation (Saad et al., 2008, p. 433). Essentially, the Triple Helix is defined as a hybrid network of relationships bridging the gap between academia, industry, and the state (Carayannis et al., 2012, p. 2).

Historically, the foundations of this model can be traced back to the economic revitalization of Boston in the 1930s. This period saw a pioneering partnership where university-led research was directly linked to industrial staff training (Arnkil et al., 2010, p. 13). According to Torkkeli (2007), the model matured through three distinct evolutionary stages:

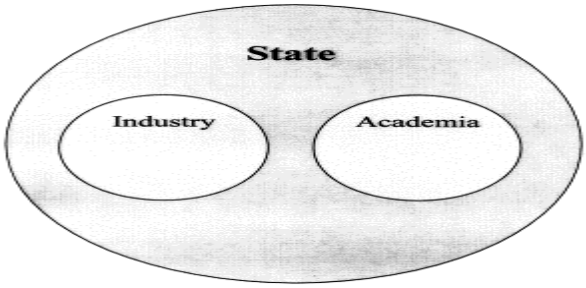
1. **The Institutional Phase:** Defining the three pillars in formal institutional terms.
2. **The Communication Phase:** Addressing the challenges of dialogue and knowledge transfer between these pillars.

3. **The Hybridization Phase:** Focusing on the creation of overlapping, hybrid interfaces between university, government, and industry.

To better understand these dynamics, Etzkowitz and Leydesdorff categorized the Triple Helix into three specific configurations (Etzkowitz et al., 2000, p. 3):"

Statist Model: In this initial configuration, often referred to as the Statist Model, the state exerts significant control over both industry and academia. By monitoring and directing both spheres, the government acts as the central coordinator of innovation. A clear historical example can be found in the Soviet Union and several Latin American nations, where the state provided all necessary resources and dictated the scope of development projects. Under this top-down approach, innovation policy was limited to the government orchestrating bilateral links between universities and industrial players, leaving little room for independent synergy.

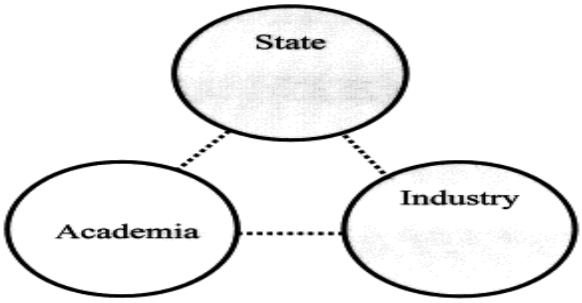
Figure 01: Statist Model



Source: Etzkowitz et al., 2000. The dynamics of innovation: from National Systems and 'Mode 2' to a Triple Helix of university–industry–government relations, p3.

Laissez-faire Model: In sharp contrast to the statist approach, the Laissez-faire Model features university, industry, and the state as strictly autonomous entities. Under this configuration, each sphere operates within its own rigid boundaries, and interactions between them are infrequent and modest at best. This model was famously exemplified by the United States for much of the 20th century, where a strong emphasis on market independence and academic freedom kept the three pillars functioning in relative isolation from one another.

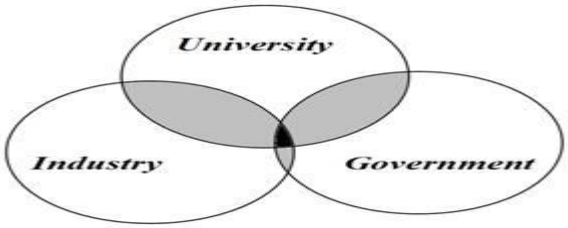
Figure 02: Laissez-faire



Source: Etzkowitz et al., 2000. The dynamics of innovation: from National Systems and 'Mode 2' to a Triple Helix of university–industry–government relations, p3.

Balanced Helix Model: In the Balanced Model (Triple Helix III), the rigid boundaries of the previous stages dissolve into a dynamic ecosystem of overlapping spheres. This configuration emphasizes the vital importance of reciprocal feedback loops, where constant interaction between universities, industry, and government generates entirely new insights for innovation. Unlike the top-down or isolated models, this version fosters a 'knowledge space' where each pillar not only fulfills its traditional role but also adopts the strengths of the others—such as universities becoming entrepreneurial or governments acting as venture capitalists. This balanced synergy is what creates a truly resilient and self-sustaining national innovation system.

Figure 03: Balanced or Hybrid Model



Source: Etzkowitz et al., 2000. The dynamics of innovation: from National Systems and 'Mode 2' to a Triple Helix of university–industry–government relations, p3.

A/ State-University: Extensive literature highlights the state's pivotal role in bridging the gap between academia and industry. Within the Triple Helix framework, the government acts as a facilitator, creating 'cooperation bridges' that allow for seamless interaction between institutional spheres. As Zhou (2008, p. 114) suggests, this model empowers the government to mobilize university and industry participation in innovation initiatives whenever and wherever needed.

In the specific context of Algeria, the government has made concerted efforts to enhance academic efficiency by reforming faculty wage policies and promoting skill development through both short-term and long-term internships. However, while state-funded research programs—such as the PNR and PRFU—exist, they remain modest compared to those in developed nations, especially when viewed against the backdrop of the current university teaching climate. Consequently, there is a pressing need to expand Algeria's research infrastructure, which currently stands at approximately 1,425 laboratories and research centers (DGRSDT, 2015).

A comparative analysis with leading economies underscores this gap. For instance, in 2009, China's university R&D expenditures accounted for 34% of public spending, while the budget for R&D within official institutions reached a significant 59% (Cai & Liu, 2015, p. 7). These investments are fundamental to a nation's innovative sovereignty. In contrast, the productivity of Algerian research centers remains a concern. A case in point is the CREAD center, which reported zero patent filings as of 2013 (DGRSDT, 2013, p. 17). To rectify this, the state must not only increase financial allocations to these laboratories but also implement a more robust regulatory framework. This includes offering tax incentives and grants to private

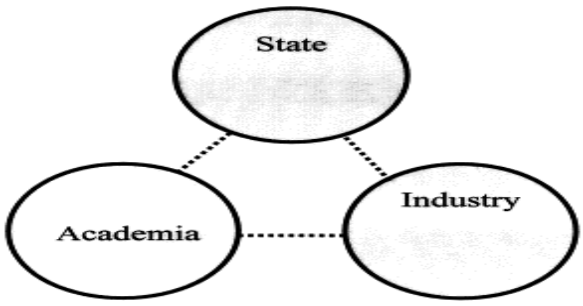
enterprises, thereby encouraging them to integrate university students into the industrial environment through internships.

B/ State-Industry: The role of industrial policy in economic development necessitates a deeper exploration of the relationship between industry and the state. While certain aspects of this interaction—such as tax incentives and investment policies—are highly visible in practice, the underlying economic functions of state-business relations often remain overlooked. According to Doner and Schneider, organized business interests must perform several market-critical functions that are essential for managing this relationship. These include maintaining macroeconomic stability, fostering horizontal and vertical coordination, reducing information costs, setting industry standards, and enhancing quality control (Te-Velde, 2013, p. 11).

Consequently, the partnership between the state and industry must be grounded in transparency and supported by a robust institutional framework that actively encourages entrepreneurship. In this context, the Triple Helix model emerges as a vital solution, bridging the gap between the public sector and private enterprise to foster a climate conducive to sustained economic growth.

However, applying this model in Algeria presents significant challenges. According to the *Doing Business* report (Table 1), Algeria was ranked 157th globally in 2022. A comparative analysis between 2019 and 2022 reveals that while the first four indicators showed marginal improvements, the remaining metrics stagnated. This lack of significant progress highlights the urgent need for deeper structural reforms to align Algeria's industrial climate with the requirements of a functional Triple Helix system.

Figure 02: Laissez-faire

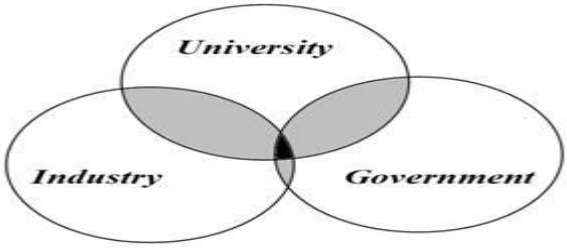


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Table 01: Ease of Doing Business in Algeria

Indicators	DB 2020 Ranking	DB 2019 Score	DB 2020 Score	DB 2020 Score	DB 2021 Score	DB 2022 Score	Score change (% points)
Global	157	48,6	48,5	48,8	48,7	48,6	+0,1
Starting a Business	152	78	77,9	77,8	77,7	78	+0,1
Dealing with Construction Permits	121	65,3	64,6	65,4	65,7	65,8	+0,7
Getting Electricity	102	72,1	71,9	71,4	71,6	71,8	+0,2

Registering Property	165	44,3	44,3	44,3	44,3	44,3	..
Getting Credit	181	10	10	10	10	10	..
Protecting Minority Investors	179	20	20	20	20	20	..
Paying Taxes	158	53,9	53,9	53,9	53,9	53,9	..
Trading Across Borders	172	38,4	38,4	38,4	38,4	38,4	..
Enforcing Contracts	113	38,4	54,8	38,4	38,4	38,4	..
Resolving Insolvency	81	49,2	49,2	49,2	49,2	49,2	..

Source: <https://francais.doingbusiness.org/fr/data/exploreeconomies/algeria>, 05/05/2022

Furthermore, an analysis of the entrepreneurial landscape reveals significant structural hurdles. As illustrated in Table 2, the process of establishing a company in Algeria remains exceptionally burdensome. A primary indicator of this stagnation is the number of administrative procedures required to launch a business. In 2022, Algeria continued to lag considerably behind not only the high-income OECD nations but also its regional peers across the Middle East and North Africa (MENA). Notably, these barriers to entry persist across both genders, suggesting that the regulatory environment remains a major bottleneck for the domestic private sector, regardless of the entrepreneur's profile

Table 02: Business Creation in Algeria

Indicator	Algeria	Middle East and North Africa	OECD high income
Procedures - Men (number)	12	6,5	4,9
Time - Men (days)	18	19,7	9,2
Procedures - Women (number)	12	7,1	4,9
Time - Women (days)	18	20,3	9,2

Source: <https://francais.doingbusiness.org/fr/data/exploreeconomies/algeria#DB_sb>, 06/05/2022

A further critical challenge lies in the accessibility of financing. As demonstrated in Table 3, Algeria continues to underperform significantly in the 'Getting Credit' indicator compared to both OECD nations and its regional peers in the Middle East and North Africa (MENA) as of 2022. The data reveals a notably weak 'Strength of

Legal Rights' index, suggesting an inadequate legal framework for collateral and bankruptcy. Even more concerning is the 'Depth of Credit Information' index, which stalled at zero in 2022. This lack of transparency and data availability creates a high-risk environment for lenders, effectively stifling the private sector's ability to secure the capital necessary for R&D and collaborative innovation projects.

Table 03: Getting Credit in Algeria

Indicator	Algeria	Middle East and North Africa	OECD high income
Strength of legal rights index (0–12)	2	3,1	6,1
Depth of credit information index (0–8)	0	5,3	6,8

Source: <https://francais.doingbusiness.org/fr/data/exploreeconomies/algeria#DB_gc>, 06/05/2022

Despite these challenging statistics, Algeria is actively seeking to reverse these trends by fostering a more transparent and committed partnership with industrial stakeholders. A clear signal of this strategic shift was the preparation led by Prime Minister Abdelaziz Djerad for the high-level 'Tripartite' meeting. This initiative underscores the state's intention to bridge the gap between public policy and industrial reality. Central to these discussions is the revitalisation plan proposed by the Ministry of Industry and Mines, which positions the private sector as a critical partner tasked with accompanying government efforts in economic restructuring.

A primary objective of this Tripartite dialogue is the systemic dismantling of 'bureaucratic bottlenecks' that have historically stifled entrepreneurial initiative. By streamlining administrative hurdles, the government aims to expedite access to specialized funding, particularly for small and emerging enterprises (SMEs). Furthermore, the state is prioritizing strategic investment in high-potential sectors such as desert agriculture. Following the Council of Ministers' approval to establish a dedicated Office for Desert Agriculture, the focus has shifted toward reclaiming millions of hectares to develop large-scale industrial farming—a move that represents a significant expansion of the Algerian innovation landscape (N., 2022).

C/ University-State: Universities serve as a fundamental pillar for the state, providing essential functions that extend far beyond traditional classroom instruction. Primarily, they act as a vital engine for human capital development, particularly in training specialized labor for the public works and infrastructure sectors. Furthermore, academic institutions offer a reservoir of expertise, contributing evidence-based research and strategic studies to help resolve complex societal and governance challenges. Beyond these internal functions, a prestigious university system can significantly enhance a nation's global reputation. By attracting international scholars and experts for research exchanges or academic tourism, universities bolster a state's 'soft power' and international standing. A prime

example is Harvard University, which serves as a major economic and intellectual driver for the United States.

In the Algerian context, however, the university's contribution to the state's strategic goals remains underdeveloped. While several institutional frameworks have been established to bridge this gap, their impact has been limited. A notable attempt at synchronization was the inter-ministerial agreement signed on October 10, 2015, between the Ministry of Higher Education and the Ministry of Public Works. This partnership specifically aimed to qualify and modernize human resources for the national infrastructure sector (MESRS, 2015). Despite such formal agreements, the transition from administrative cooperation to a fully integrated and productive 'knowledge economy' remains a work in progress

D/ University-Industry: In the modern knowledge-based economy, the role of the university has undergone a profound transformation. Moving beyond its traditional focus on research and basic instruction, the university has emerged as a primary catalyst for innovation and a central source of knowledge in the science and technology sectors (Razak & Saad, 2007, p. 212). Within the Triple Helix framework, this shift is often described as the 'Second Scientific Revolution,' where academic institutions take an active role in socio-economic development through entrepreneurship and the practical application of knowledge to solve industrial challenges (Villarreal & Calvo, 2015, p. 4).

Scholars like Dinapoli (2011) and Etzkowitz et al. (2000) emphasize that universities must not only generate new technologies but also foster a qualified workforce and establish direct partnerships with private investors and industry. Furthermore, the geographical density of universities within a region significantly enhances the likelihood of industry-academia collaboration by providing companies with a broader range of research options (Maeitta, 2015, p. 1342). In this paradigm, the university's mission is no longer restricted to producing research results; it is tasked with cultivating innovative researchers who contribute to the well-being of society as a whole (Lilles & Rõigas, 2017, p. 4).

This 'entrepreneurial university' model is widely implemented across Europe. In Italy, for instance, academic research is heavily tailored to the agri-food sector to support the high number of small-scale enterprises that lack internal R&D capabilities (Maeitta, 2015, p. 1345). Mirroring these global trends, Algeria has recently accelerated its efforts to institutionalize this 'University-Industry' duality. A milestone agreement was reached on October 5, 2015, between the Ministry of Higher Education and the Forum of Heads of Enterprises (FCE), resulting in the creation of a joint committee and a dedicated scientific research support fund with an initial allocation of 50 million DZD (MESRS, 2015).

To solidify these links, Algeria has mandated the creation of 'Entrepreneurship Houses' and business incubators at every university nationwide, serving as strategic bridges to the industrial sector. Institutional restructuring has also played a role; for example, shifting the oversight of the National School of Administration (ENA) and

the continued success of the Algerian Petroleum Institute (IAP) under its respective ministry demonstrate a move toward aligning graduates with market demands (Boutifour et al., 2015, p. 97). Most recently, framework agreements between the Ministry of Industry and the Ministry of Higher Education—alongside specialized partnerships with industrial complexes like 'Imetal'—confirm a clear state intention to translate the Triple Helix theory into tangible industrial practice (aps.dz, 2020).

Conclusion

In conclusion, the Triple Helix model serves as more than a simple map of institutional relationships; it illuminates the profound internal transformations required within the university, industry, and government spheres (Leydesdorff & Etzkowitz, 2000, p. 148). The success of this system depends on the dynamism and flexibility of the overlaps between these pillars—qualities that are the hallmarks of any functional innovation ecosystem (Etzkowitz et al., 2000, p. 10). Comparative studies with emerging economies, such as Malaysia, demonstrate that the effective implementation of the Triple Helix is often intrinsically linked to the broader pace of national economic development (Saad et al., 2008, p. 441).

For Algeria, political decision-makers must critically evaluate both the systemic incentives and the structural obstacles currently hindering this model (Boutifour et al., 2015, p. 107). To foster effective cooperation, the state must increase investment in science and technology while simultaneously modernizing the industrial sector to align with academic output. Cultivating a national 'culture of innovation' is equally essential. This requires improving the working conditions within universities to elevate the quality of experimental research and accelerating R&D expenditures specifically targeted at laboratories and research centers.

It is also worth noting that recent literature has expanded this framework into the 'Quintuple Helix.' This advanced model incorporates two additional dimensions: the 'social' (encompassing media, culture, and lifestyle) and the 'natural environment,' which prioritizes sustainable development. Ultimately, the modern innovation landscape relies on the proactive role of universities, the strategic leadership of the government in policy-making, and the agility of industrial alliances in product development (Arnkil et al., 2010, p. 12).

While the current study provides a comprehensive theoretical overview, it is not without limitations—most notably the absence of an empirical, applied component due to the relative novelty of these concepts in the Algerian context. Future research should consider integrating the societal and environmental variables of the Quintuple Helix to further explore these complex relationships, ideally through applied case studies within the Algerian industrial landscape.

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