

R+D Management, Innovation and Entrepreneurship in Latin America: Analysis of Organizational Strategies and Policy Frameworks

Fiorella Rocío, Valero-Palomino, Doctora ¹, Omar, Bullón-Solís, Doctor ², Nadia, Bullón-Solís, Magister ³, Wilber, Quispe-Medina ⁴, Alcides, Muñoz-Ocas, Doctor ⁵

^{1,2,3,4} Universidad César Vallejo, Perú, frvalerop@ucvvirtual.edu.pe, obullon@ucvvirtual.edu.pe, nbullons@ucvvirtual.edu.pe, wilberquispemedina@gmail.com, ⁵ amunoz@unsm.edu.pe

Abstract– This article analyses the management of research and development (R+D), innovation and entrepreneurship in Latin American organizations from a qualitative approach. Through interviews and documentary analysis processed with NVivo 14, three key dimensions were identified: institutional articulation, internal organizational capacities, and access to public support mechanisms. The findings show the fragmentation of the regional innovation system, weaknesses in knowledge management, and the disconnect between formulated policies and their effective implementation. It is concluded that institutional and organizational transformation is essential for the strengthening of R+D+i ecosystems in the region.

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I. INTRODUCCIÓN

The management of research, development (R&D), innovation, and entrepreneurship has taken center stage in debates on economic and social development, especially in emerging economies such as those in Latin America. In a context dominated by technological acceleration, the evolution towards knowledge economies, and intensified international competition, the ability to generate, absorb, and execute knowledge has been posited as a fundamental element for obtaining sustainable competitive advantages [1,2].

In Latin America, however, the trajectory of science, technology, and innovation (STI) policies has been marked by discontinuities, low investment in R&D, and weak coordination among actors in the national innovation system (NIS), such as the state, universities, the private sector, and research centers [3,4]. According to the Science and Technology Indicators Network (RICYT), the region invests on average less than 1% of its GDP in R&D activities, a figure considerably lower than that of OECD countries [5]. Furthermore, most of the investment comes from the public sector, reflecting the limited participation of the business sector in the innovation process [6].

1. Innovation systems

The notion of innovation systems emerged in the 1980s as an alternative to linear approaches to innovation, which conceived of the process as a sequence from basic research to commercialization. Freeman [1], Lundvall [2], and Nelson [3] argued that innovation should be understood as an interactive phenomenon, the result of cooperation and competition among multiple actors, with public policies and institutions playing a central role. From this perspective, innovation systems are complex social and economic structures that determine the capacity of a country or region to generate and exploit knowledge.

In Latin America, the literature shows that national innovation systems (NIS) have internal and external asymmetries. Internally, there is a strong concentration of research in a few institutions and metropolitan regions, which creates territorial gaps in the distribution of capabilities [4]. Externally, the region's NIS are heavily dependent on the importation of technologies developed in industrialized countries, which limits the generation of endogenous innovations and the possibility of establishing autonomous technological trajectories [5]. This technological dependence reinforces the peripheral status of Latin American economies in the global economic system.

The theory of innovation systems also highlights the importance of interactions between universities, businesses, and the state, known as the “triple helix” (Etzkowitz and Leydesdorff) [6]. However, in Latin America, these interactions tend to be incipient and fragmented, due both to historical mistrust between the productive and academic sectors and to regulatory frameworks that are ill-suited to promoting technology transfer. In this sense, the deficit is not only reflected in low levels of investment in R&D—0.56% of GDP on average in the region in 2022 [7]—but also in the poor quality of the links that should connect the system.

Another key aspect is the weakness of demand for knowledge, conceptualized by Arocena and Sutz [8], who argue that in the global South, companies face uncompetitive markets that do not encourage them to invest in research and development. This explains why, in the region, most R&D investment comes from the public sector (around 60–70%), while business participation continues to lag behind [9]. Thus, Latin American NIS tend to reproduce “supply-driven” rather than “demand-driven” innovation dynamics, which reduces their effectiveness in transforming productive structures.

In short, the theoretical framework of innovation systems shows that institutional weakness, poor coordination between actors, and technological dependence are factors that hinder the transition to knowledge-based economies in Latin America. This reality contrasts with the views of Lundvall [2], who highlights interactive learning as the core of innovative processes, and with the experiences of OECD countries, where the consolidation of robust NIS has been an engine of sustained growth.

2. Knowledge management

Knowledge management emerged in the 1990s as an interdisciplinary field integrating economics, management studies, and organizational theory, with the objective of explaining how organizations create, transfer, and exploit knowledge as a strategic resource. Nonaka and Takeuchi [10], through their theory of the knowledge-creating organization, argue that innovation results from the continuous interaction between tacit knowledge—rooted in individual experience and skills—and explicit knowledge, which is formalized in documents, patents, and procedures. The SECI model (socialization, externalization, combination, and internalization) remains a foundational framework for understanding how individual learning processes are transformed into collective organizational competencies.

Subsequent research has expanded this perspective by emphasizing that effective knowledge management requires not only knowledge creation but also its systematic codification, governance, and strategic alignment with organizational objectives [24]. From this viewpoint, knowledge management is closely linked to organizational learning, institutional memory, and the design of routines that allow knowledge to be retained and reused over time [25]. Organizations that fail to institutionalize knowledge tend to depend excessively on individual expertise, increasing vulnerability to personnel turnover and organizational disruption.

In the Latin American context, knowledge management faces significant structural limitations. First, the scarcity of highly qualified human capital constrains organizations’ ability to absorb and transform knowledge. Although the number of researchers in the region increased from 442,835 in 2013 to 642,383 in 2022 [11], this growth remains insufficient when compared to international averages. This gap weakens firms’ absorptive capacity, particularly their ability to internalize

external knowledge generated by universities, research centers, or multinational corporations [26].

Second, high labor turnover and employment insecurity in knowledge-intensive sectors undermine the continuity of organizational learning processes, especially in small and medium-sized enterprises (SMEs) [12]. Empirical studies show that unstable employment relationships hinder the accumulation of tacit knowledge and disrupt informal knowledge-sharing networks, which are critical for innovation in environments with limited formal R&D investment [27]. As a result, learning processes often remain fragmented and short-lived.

Despite these constraints, the most innovative organizations in Latin America exhibit a set of common characteristics. They tend to adopt flexible organizational structures, promote multidisciplinary collaboration, and engage in open learning mechanisms, such as partnerships with universities, participation in productive clusters, and integration into international knowledge networks [13]. These practices facilitate knowledge recombination and reduce the cognitive and technological isolation frequently observed in firms operating in emerging economies [28].

Such organizational behaviors are consistent with Teece’s concept of dynamic capabilities, defined as the capacity to integrate, build, and reconfigure internal and external competencies in response to rapidly changing environments [14]. In contexts of economic volatility and institutional uncertainty, as is often the case in Latin America, dynamic capabilities play a decisive role in sustaining innovation processes and enabling firms to adapt to shifting market and technological conditions [29]. Knowledge management systems act as key micro foundations of these capabilities by supporting sensing, learning, and reconfiguration activities [30].

However, evidence suggests that most companies in Latin America lack explicit knowledge management strategies. The World Bank estimates that approximately 70% of the region’s workforce is employed in microenterprises or operates under self-employment arrangements [15]. These sectors typically rely on informal knowledge practices and incremental, low-technology innovation, which limits the development of structured knowledge ecosystems capable of supporting cumulative learning and technological upgrading [31].

Moreover, the prevalence of informality and short-term survival strategies discourages investment in digital infrastructure, training, and knowledge documentation systems [32]. This situation constrains inter-firm learning and weakens regional innovation systems, as knowledge remains localized and rarely diffuses across organizational or sectoral boundaries [33]. Consequently, innovation tends to be isolated rather than systemic.

Addressing these challenges requires coordinated efforts at both the organizational and policy levels. Strengthening knowledge management in Latin America involves promoting human capital development, incentivizing collaborative

innovation, and supporting SMEs in the adoption of formal knowledge practices [34]. Without such interventions, knowledge creation will continue to have limited impact on productivity and competitiveness, reinforcing existing structural heterogeneities within the region [35].

3. Public policies and the entrepreneurial state

The role of the state in promoting science, technology, and innovation (STI) has undergone a substantial transformation over recent decades. In Latin America, public policies have traditionally been shaped by a narrow conception of the state as a regulatory and subsidiary actor, whose primary function was to address market failures through corrective interventions. This approach, influenced by neoclassical economic theory, assumed that innovation would emerge endogenously from private-sector incentives once appropriate regulatory frameworks were in place. However, mounting empirical evidence has challenged this assumption, revealing the limits of purely market-driven innovation models in structurally heterogeneous and unequal economies [35].

Contemporary debates, strongly influenced by Mariana Mazzucato's theory of the entrepreneurial state, have reframed this vision by positioning the state as an active agent capable of shaping and creating markets rather than merely fixing them. According to this perspective, the state plays a strategic role in setting long-term innovation agendas, mobilizing resources toward high-risk technological trajectories, and coordinating collective action across sectors [36]. This reconceptualization implies a shift from reactive policy instruments toward mission-oriented innovation policies that articulate clear societal goals and mobilize both public and private actors around them [37].

Mazzucato argues that many of the most transformative innovations of the contemporary global economy, including the internet, biotechnology, renewable energy technologies, and artificial intelligence—were made possible by sustained public investment in early-stage, high-uncertainty research. These investments were often undertaken in contexts where private capital was unwilling or unable to bear the risks involved [38]. From this standpoint, innovation policy should not be confined to subsidizing private R&D but should instead involve the state in defining strategic missions, building innovation ecosystems, and ensuring that the benefits of innovation are broadly distributed across society [39].

In the Latin American context, this approach has increasingly informed policy discussions and institutional strategies. Regional organizations such as Economic Commission for Latin America and the Caribbean (ECLAC) and the Inter-American Development Bank (IDB) have emphasized the need to strengthen state capacities for designing and implementing innovation policies oriented toward addressing structural challenges, including energy transition, food security, public health, and inclusive digital transformation [40]. Within this framework, the entrepreneurial state is understood not only as a driver of competitiveness, but

also as a key agent of social, environmental, and productive transformation [41].

Public innovation policies in the region have deployed a diverse set of instruments aligned with this paradigm. These include direct public funding for scientific research and technological development through national agencies; the promotion of technology clusters and science parks aimed at fostering collaboration between universities, firms, and local governments; and the creation of technology-based entrepreneurship and startup programs supported by public seed capital. Additionally, innovative public procurement has emerged as a strategic tool, enabling the state to leverage its purchasing power to stimulate innovation in priority sectors such as health, energy, and digital services [42].

Despite these advances, progress across Latin America has been uneven and constrained by persistent structural limitations. Weak coordination between universities, research centers, and the productive sector continues to hinder knowledge transfer and commercialization [43]. Institutional fragmentation and overlapping mandates among public agencies reduce policy effectiveness, while fiscal constraints limit the scale and continuity of long-term innovation investments [44]. Moreover, frequent changes in government often result in policy discontinuity, undermining the cumulative learning processes required for effective mission-oriented innovation strategies [45].

These challenges are compounded by a relatively weak innovative culture among firms in the region, which tend to concentrate on low-risk activities and exhibit chronically low levels of investment in research and development. This behavior reflects both structural conditions and historical patterns of productive specialization, reinforcing technological dependence and limiting opportunities for upgrading within global value chains [46].

Adopting the entrepreneurial state paradigm therefore implies a profound reorientation of public policy. The state must be willing to assume risk, finance long-term and uncertain projects, and engage in strategic partnerships with the private sector, academia, and civil society. Importantly, this also requires developing institutional mechanisms to ensure accountability, learning, and the socialization of returns from public investment in innovation [47]. Without such mechanisms, mission-oriented policies risk being captured by narrow interests or failing to deliver broad societal benefits.

For Latin America, this approach is particularly relevant given the region's persistent challenges of inequality, technological lag, and environmental vulnerability. Addressing these issues requires innovation trajectories that are unlikely to emerge spontaneously from market forces alone. In this sense, the entrepreneurial state represents not merely an alternative policy framework, but a necessary condition for advancing toward more inclusive, resilient, and sustainable development models in the region [48], [49].

TABLE 1.
INTEGRATED SUMMARY

Theoretical area	Empirical reality in Latin America
Innovation systems (Freeman, Lundvall, Nelson)	interdependent networks of actors Networks exist, but with low effective coordination
Knowledge management (Nonaka and Takeuchi)	Emerging practices in innovative companies, still limited in scale
Dynamic capabilities (Teece)	organizational learning in leading corporations; many SMEs lack this
Entrepreneurial state (Mazzucato)	Prototypes of active policies, but insufficient; urgent need to reorient public institutions

Description. The table compares theoretical approaches to innovation with their expression in Latin America. It shows that innovation systems have poorly articulated networks; knowledge management appears in practices that are still limited; dynamic capabilities are concentrated in a few corporations, leaving many SMEs behind; and the entrepreneurial state is reflected in incipient active policies, which require greater institutionality and continuity.

II. METHODOLOGY

This research adopts a qualitative, exploratory, and descriptive design, with the objective of gaining an in-depth understanding of how research and development (R&D), innovation, and entrepreneurship processes are managed within Latin American organizations, as well as of the broader institutional and policy environments in which these processes are embedded. The qualitative approach is particularly appropriate given the study's focus on organizational practices, institutional dynamics, and contextual factors that cannot be adequately captured through quantitative methods alone.

The study employs a multiple case study strategy based on the purposeful selection of organizations located in three Latin American countries—Mexico, Peru, and Colombia—which exhibit differing levels of institutional development in science, technology, and innovation. This comparative design enables the identification of both common patterns and context-specific variations in R&D and innovation management across national settings. Data collection was conducted through semi-structured interviews with key informants, including innovation managers, senior executives, public officials, and academic experts. These primary sources were complemented by documentary analysis of national innovation policies, organizational reports, strategic plans, and relevant legislative frameworks [21].

The data collected were systematically processed and analyzed using thematic coding techniques supported by NVivo software. This analytical procedure facilitated the identification of recurring themes, divergences, and relational patterns linking organizational strategies with public policy instruments and institutional conditions. Through this approach, the study achieves a nuanced and context-sensitive understanding of

R&D, innovation, and entrepreneurship management in Latin America, capturing both structural constraints and organizational responses within the region's heterogeneous innovation systems.

III. RESULTS AND DISCUSSION

Qualitative analysis of interviews and institutional documents, processed using NVivo 14, identified three fundamental dimensions that modulate the management of R&D, innovation, and entrepreneurship in Latin American organizations: [19] institutional coordination, [20] internal organizational capacities, and [21] access to public support mechanisms. These dimensions correspond to previous approaches to innovation systems in Latin America that highlight fragmentation among actors, limited internal capacities, and poor public policy design [19–21].

Institutional coordination

A total of 46 references from 12 sources were coded under the thematic node of institutional coordination. There was little visible connection between companies, universities, and public research centers, corroborating the assertion made by Arocena and Sutz about the low density of relationships in Southern innovation systems [19]. Regulatory and administrative frameworks perceived as rigid, bureaucratic, and therefore limiting strategic alliances and interactions prevailed, particularly in Mexico and Peru.

“Universities are closed off in their own processes, and the State has no incentives to facilitate this connection” (Interview 5, Peru).

In addition, there was a clear lack of technological intermediation platforms, which are considered essential for fostering collaborative environments [22].

Internal organizational capabilities

This was the most frequently coded node, with 61 references in 15 sources. In the most dynamic organizations—mainly startups and technology SMEs—we found the use of agile methodologies and horizontal structures that promote organizational learning, a reality that fits in with what was once part of the corpus of dynamic capabilities referred to by Teece himself [23] and echoes studies conducted at the regional level that identify the need for capabilities that can be decisive in sustaining innovation processes [20].

“The key has been that here, error is encouraged as part of learning, and that has created a culture of continuous improvement” (Interview 3, Mexico).

In contrast, many traditional organizations have hierarchical structures, low investment in human capital, and low systematization of knowledge. In Colombia, there were success stories of internal innovation laboratories that function as nodes of experimentation and continuous improvement, which is a practice consistent with the accumulation of technological capabilities according to Dutrénit [20].

Public support and innovation policies

The third node, which refers to the issue of public support, has 55 references, but only 13 sources. In this node, participants expressed bureaucracy, little institutional continuity, and poor transparency in the proposed calls for proposals. The participants' perceptions close the circle of criticism from Casas and Luna, who argue that many Latin American public policies are implemented without the necessary operational conditions [21].

"The fund helped us, but applying was exhausting. We only managed to apply because we had an external advisor" (Interview 10, Peru).

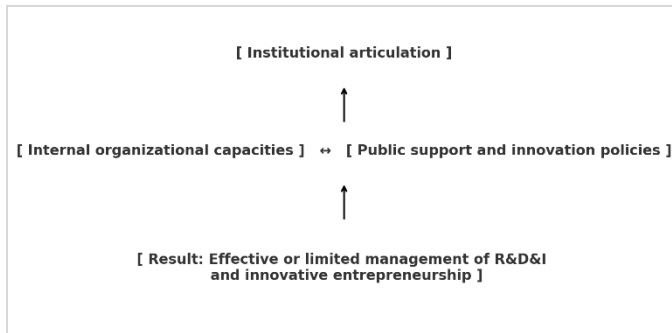
Similarly, it was concluded that the production of public policies in the field of cooperation by national communities depended heavily on international funding, and there was a disconnect between the public policies developed at the national level and their implementation in the limited territory of user communities [20]. However, in the case of Colombia, it was found that there were experiences of more inclusive regional calls for proposals, many of which were linked to international cooperation efforts or inter-institutional alliances.

Comparative synthesis and relationships between dimensions

The three dimensions identified are dynamically interrelated, and their combination explains the intensity, focus, and sustainability of the R&D&I strategies implemented in each organization, as summarized in Figure 1.

FIGURE 1.

MODEL OF INTERACTION OF FACTORS THAT CONDITION
R&D&I MANAGEMENT IN LATIN AMERICAN
ORGANIZATIONS



Description. The figure shows the interaction of three crucial dimensions that determine the effectiveness of R&D&I management in Latin American organizations. At the top is institutional coordination, which logically affects the development of the internal organizational capacities discussed in the center of the model. On the other hand, these capabilities are bidirectionally interrelated with public support mechanisms/innovation policies, thus generating a dynamic circuit.

Indeed, the combination of the different dimensions, as well as their quality, will influence the outcome, so that anything from very limited R&D&I and innovative

entrepreneurship management to highly effective management could be achieved. This model is proposed based on the qualitative analysis of interviews and documentation that was coded with NVivo and reflects causal and conditional relationships between the factors.

TABLE 2.
SUMMARY OF FINDINGS BY COUNTRY AND DIMENSION
ANALYSED

Dimension	Mexico	Peru	Colombia
Institutional coordination	Low interaction with universities; disjointed policies	Weak university-business links; lack of government incentives	Emerging relationship with academic actors; better regional framework
Organizational capacities	Presence of qualified technical teams; incipient culture of innovation	Little investment in knowledge management; rigid structures	Implementation of innovative laboratories in companies
Public support	Restricted access; bureaucracy in funding	Dependence on international financing	Greater presence of regional calls for proposals with a collaborative approach

Description. Comparison of institutional coordination, organizational capacities, and public support for R&D&I in Mexico, Peru, and Colombia. The table summarizes the main characteristics by country based on the three key dimensions identified in the study.

The results obtained are consistent with prior assessments highlighting the structural obstacles that Latin America must overcome in the fields of innovation and entrepreneurship [24]. In particular, the limited institutional coordination identified in the cases analyzed reflects a persistent weakness of regional innovation systems. As previously noted by Arocena and Sutz, innovation systems in the Global South tend to be characterized by fragile and discontinuous relationships among key actors, especially universities, firms, and public agencies [22]. This structural fragility constrains the circulation of knowledge, limits the development of collaborative research projects, and undermines the consolidation of sustainable innovation ecosystems [23]. The lack of stable interaction mechanisms also reduces trust among actors, further discouraging long-term cooperation and joint risk-taking [50].

At the organizational level, internal capabilities emerge as a critical differentiating factor in the implementation of research, development, and innovation (R&D&I) strategies. Organizations that develop agile structures, foster organizational learning, and actively manage knowledge

display greater adaptability and strategic dynamism, in line with Teece's dynamic capabilities framework [20]. These firms are better positioned to sense technological opportunities, reconfigure resources, and respond to environmental uncertainty. However, the majority of organizations examined exhibit significant limitations in this regard, particularly with respect to sustained investment in training, formalized learning routines, and systematized innovation processes. This finding is consistent with Dutrénit's argument regarding the region's historically weak accumulation of technological capabilities and limited learning trajectories [13], which continue to constrain innovation outcomes [51].

With respect to the availability of public support, the findings confirm a persistent gap between the formulation of science, technology, and innovation (STI) policies and their effective implementation. This disconnect has been widely documented in literature. Casas and Luna emphasize that many innovation policies in Latin America remain declarative in nature, lacking coherent operational instruments, adequate funding, or institutional mechanisms to ensure execution and evaluation [21], [23]. Participants in this study similarly reported that bureaucratic complexity, administrative delays, and frequent changes in policy priorities significantly hinder access to public funding and innovation programs. These constraints reinforce the argument that the state's role should evolve toward a more proactive, strategic, and mission-oriented approach, as proposed by Mazzucato through the concept of the entrepreneurial state [22], particularly in environments marked by structural uncertainty and weak private investment in R&D [52].

Despite these limitations, the evidence also points to the existence of notable experiences in which organizations have successfully adapted and generated significant innovations. These cases are often associated with participation in territorial collaboration networks, productive clusters, or regional support programs that facilitate access to knowledge, financing, and complementary capabilities. Such experiences suggest that, although Latin American innovation systems remain fragile, they contain latent capacities that can be activated through more coherent public policies, stronger institutional coordination, and sustained multisectoral alliances [53]. When supported by stable governance structures and learning-oriented policy frameworks, these localized initiatives can contribute to broader processes of capability building and regional development [54].

Overall, the findings underscore that overcoming structural barriers to innovation in Latin America requires not only increased investment, but also qualitative improvements in institutional design, organizational learning, and policy coherence. Strengthening linkages among actors, reducing fragmentation, and ensuring continuity in innovation policies are essential conditions for transforming isolated success stories into systemic innovation dynamics [55], [56].

IV. CONCLUSIONS

This study indicates that the management of research and development (R&D), innovation, and business creation (entrepreneurship) in Latin America is shaped by the interaction of three closely interrelated factors: the degree of institutional coordination, the strength of internal organizational capabilities, and effective access to public support mechanisms. Deficiencies in any of these dimensions significantly constrain the feasibility of implementing sustainable innovation strategies, particularly in contexts characterized by fragmented public policies, weak articulation between universities and productive actors, and organizations with limited specialized technical and managerial capabilities.

The findings underscore the need to critically reassess the institutional frameworks governing innovation in Latin America. Such frameworks should move beyond isolated interventions and instead prioritize the construction of stable linkages among key actors, the reduction of bureaucratic and administrative barriers, and the promotion of organizational models that are more open to learning, experimentation, and collaboration. In this sense, public policies should not be narrowly focused on financing individual projects, but rather oriented toward long-term capacity building, the strengthening of inter-institutional networks, and the sustained accompaniment of organizational and technological change processes.

From an academic standpoint, the research reinforces the relevance of innovative systems and dynamic capabilities as robust conceptual frameworks for interpreting organizational behavior and performance in the region. These approaches provide valuable analytical tools for understanding how firms and institutions respond to structural constraints, uncertainty, and resource scarcity. Moreover, the study highlights the contribution of qualitative research methods for capturing contextual complexity, learning processes, and managerial practices that are often overlooked or insufficiently explained by purely quantitative approaches. By foregrounding organizational narratives and interaction patterns, qualitative analysis offers deeper insight into the mechanisms through which innovation and entrepreneurship unfold in Latin American contexts.

Overall, the results suggest that advancing innovation and entrepreneurship in the region requires an integrated strategy that simultaneously addresses institutional design, organizational learning, and policy coherence. Without such alignment, efforts to promote innovation are likely to remain fragmented and yield limited systemic impact.

REFERENCIAS

- [1] Freeman C. *Technology Policy and Economic Performance: Lessons from Japan*. London: Pinter; 1987.
- [2] Lundvall BA. *National Systems of Innovation: Towards a Theory of Innovation and Interactive Learning*. London: Pinter Publishers; 1992.
- [3] Nelson RR, editor. *National Innovation Systems: A Comparative Analysis*. Oxford: Oxford University Press; 1993.

- [4] Etzkowitz H, Leydesdorff L. The Triple Helix—University-Industry-Government relations: A laboratory for knowledge-based economic development. *EASST Rev.* 1995;14(1):14–9.
- [5] Red de Indicadores de Ciencia y Tecnología (RICYT). *El estado de la ciencia 2023*. Buenos Aires: RICYT; 2023.
- [6] Banco Mundial. *Research and development expenditure (% of GDP)* [Internet]. Washington DC: World Bank; 2023 [citado 2025 sep 10]. Disponible en: <https://data.worldbank.org/indicator/GB.XPD.RSDV.GD.ZS>
- [7] OCDE. *Main Science and Technology Indicators*. Paris: OECD; 2022.
- [8] Arocena R, Sutz J. Weak knowledge demand in the South: Learning divides and innovation policies. *Sci Public Policy*. 2010;37(8):571–82.
- [9] Casas R, Luna M. ¿Políticas de innovación o políticas para la innovación? Reflexiones desde América Latina. *Rev CTS*. 2010;5(15):79–96.
- [10] Nonaka I, Takeuchi H. *The Knowledge-Creating Company: How Japanese Companies Create the Dynamics of Innovation*. New York: Oxford University Press; 1995.
- [11] Teece DJ, Pisano G, Shuen A. Dynamic capabilities and strategic management. *Strateg Manag J*. 1997;18(7):509–33.
- [12] Teece DJ. Explicating dynamic capabilities: The nature and microfoundations of (sustainable) enterprise performance. *Strateg Manag J*. 2007;28(13):1319–50.
- [13] Dutrénit G, Sutz J, eds. *Innovation Systems and Inclusive Development: Towards a New Agenda*. Cheltenham: Edward Elgar; 2014.
- [14] Crespi G, Zúñiga P. Innovation and productivity: Evidence from six Latin American countries. *World Dev*. 2012;40(2):273–90.
- [15] Arza V, Vázquez C. Interacciones entre actores en los sistemas de innovación en América Latina: el rol de las universidades. *REDES*. 2015;21(1):135–56.
- [16] Navarro J, Llisterri J. *Políticas de apoyo al emprendimiento e innovación en América Latina: una revisión*. Washington DC: BID; 2014.
- [17] Mazzucato M. *El Estado emprendedor: Mitos del sector público frente al privado*. Barcelona: RBA; 2020.
- [18] Cimoli M, Dosi G, Stiglitz JE, eds. *Industrial Policy and Development: The Political Economy of Capabilities Accumulation*. Oxford: Oxford University Press; 2009.
- [19] Thomas H, Arza V. *Ciencia, tecnología e innovación para un nuevo pacto social en América Latina*. Santiago: CEPAL; 2020.
- [20] Weber K, Antonioni JA, Melchionna R, Villalobos MT, Nascimento AMD, Herbert J, et al. MGPD: modelo de gestión de la I+D+i en las organizaciones. *360 Rev Cienc Gest*. 2017;(2):16–29.
- [21] Espinoza-Martínez AEM, Alvarez-Aros EL. Estrategias organizacionales de capital humano: un análisis bibliométrico. *EMySO*. 2024; 2:59–71. Disponible en: <https://camjol.info/index.php/EMySO/article/view/18202>
- [22] Greer CR, Lusch RF, Hitt MA. A service perspective for human capital resources: a critical base for strategy implementation. *Acad Manag Perspect*. 2017;31(2):137–58. doi:10.5465/amp.2016.0004
- [23] Symeonidou N, Nicolaou N. Resource orchestration in start-ups: synchronizing human capital investment, leveraging strategy, and founder start-up experience. *Strat Entrep J*. 2018;12(2):194–218. doi:10.1002/sej.1269
- [24] T. H. Davenport and L. Prusak, *Working Knowledge: How Organizations Manage What They Know*. Boston, MA, USA: Harvard Business School Press, 1998.
- [25] C. Argyris and D. A. Schön, *Organizational Learning II: Theory, Method, and Practice*. Reading, MA, USA: Addison-Wesley, 1996.
- [26] W. M. Cohen and D. A. Levinthal, “Absorptive capacity: A new perspective on learning and innovation,” *Administrative Science Quarterly*, vol. 35, no. 1, pp. 128–152, 1990.
- [27] J. B. Barney, “Firm resources and sustained competitive advantage,” *Journal of Management*, vol. 17, no. 1, pp. 99–120, 1991.
- [28] H. Chesbrough, *Open Innovation: The New Imperative for Creating and Profiting from Technology*. Boston, MA, USA: Harvard Business School Press, 2003.
- [29] D. J. Teece, G. Pisano, and A. Shuen, “Dynamic capabilities and strategic management,” *Strategic Management Journal*, vol. 18, no. 7, pp. 509–533, 1997.
- [30] K. M. Eisenhardt and J. A. Martin, “Dynamic capabilities: What are they?” *Strategic Management Journal*, vol. 21, no. 10–11, pp. 1105–1121, 2000.
- [31] R. Nelson and S. Winter, *An Evolutionary Theory of Economic Change*. Cambridge, MA, USA: Harvard University Press, 1982.
- [32] G. Dosi, “Technological paradigms and technological trajectories,” *Research Policy*, vol. 11, no. 3, pp. 147–162, 1982.
- [33] B.-Å. Lundvall, *National Systems of Innovation: Toward a Theory of Innovation and Interactive Learning*. London, U.K.: Pinter Publishers, 1992.
- [34] OECD, *Knowledge Management in the Learning Society*. Paris, France: OECD Publishing, 2000.
- [35] E. Reinert, *How Rich Countries Got Rich... and Why Poor Countries Stay Poor*. London, U.K.: Constable, 2007.
- [36] M. Mazzucato, *The Entrepreneurial State: Debunking Public vs. Private Sector Myths*. London, U.K.: Anthem Press, 2013.
- [37] M. Mazzucato, “Mission-oriented innovation policies: Challenges and opportunities,” *Industrial and Corporate Change*, vol. 27, no. 5, pp. 803–815, 2018.
- [38] F. Block and M. Keller, *State of Innovation: The U.S. Government's Role in Technology Development*. Boulder, CO, USA: Paradigm Publishers, 2011.
- [39] D. Rodrik, “Industrial policy for the twenty-first century,” *CEPR Discussion Paper*, no. 4767, 2004.
- [40] ECLAC, *Innovation for Sustainable Development in Latin America*. Santiago, Chile: United Nations, 2020.
- [41] Inter-American Development Bank, *Rethinking Productive Development: Sound Policies and Institutions for Economic Transformation*. Washington, DC, USA: IDB, 2014.
- [42] OECD, *Public Procurement for Innovation: Good Practices and Strategies*. Paris, France: OECD Publishing, 2017.
- [43] A. Arocena and J. Sutz, “Weak knowledge demand in the South: Learning divides and innovation policies,” *Science and Public Policy*, vol. 37, no. 8, pp. 571–582, 2010.
- [44] R. Hausmann and D. Rodrik, “Economic development as self-discovery,” *Journal of Development Economics*, vol. 72, no. 2, pp. 603–633, 2003.
- [45] B.-Å. Lundvall et al., “Innovation system research and developing countries,” *Research Policy*, vol. 38, no. 9, pp. 1444–1452, 2009.
- [46] G. Dosi, M. Cimoli, and J. E. Stiglitz, *Industrial Policy and Development: The Political Economy of Capabilities Accumulation*. Oxford, U.K.: Oxford Univ. Press, 2009.
- [47] M. Mazzucato and G. Semieniuk, “Public financing of innovation: New questions,” *Oxford Review of Economic Policy*, vol. 33, no. 1, pp. 24–48, 2017.
- [48] UNDP, *Human Development Report: Beyond Income, Beyond Averages*. New York, NY, USA: United Nations, 2019.
- [49] World Bank, *Innovation Policy: A Guide for Developing Countries*. Washington, DC, USA: World Bank, 2010.
- [50] B.-Å. Lundvall, “Innovation as an interactive process: From user-producer interaction to the national system of innovation,” in *Technical Change and Economic Theory*, G. Dosi et al., Eds. London, U.K.: Pinter Publishers, 1988, pp. 349–369.
- [51] G. Dutrénit, “Learning and knowledge management in the firm: From knowledge accumulation to strategic capabilities,” *International Journal of Technology Management*, vol. 27, no. 2–3, pp. 178–195, 2004.
- [52] M. Mazzucato, “The state as investor of first resort: The role of the public sector in innovation,” *Policy Brief*, Institute for Innovation and Public Purpose, Univ. College London, 2015.
- [53] P. Cooke, “Regional innovation systems: Development opportunities from the ‘green turn’,” *Technology Analysis & Strategic Management*, vol. 22, no. 7, pp. 831–844, 2010.
- [54] A. Isaksen and F. Trippl, “Regional industrial path development in different regional innovation systems: A conceptual analysis,” *Regional Studies*, vol. 51, no. 7, pp. 1020–1031, 2017.
- [55] OECD, *Innovation Policy Reviews: Latin America*. Paris, France: OECD Publishing, 2016.
- [56] ECLAC, *Institutional Innovation and Public Policy in Latin America*. Santiago, Chile: United Nations, 2018.