GEOPOLITICS AND TECHNOLOGY: CONCEPTUAL DEBATES ON TECHNODIPLOMACY AND A PERIPHERAL PERSPECTIVE

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Abstract

This article examines the relevance of techno-diplomacy in a context shaped by the Fourth Industrial Revolution and the expansion of technologies such as artificial intelligence, 5G, biotechnology, and digitalization. These transformations are redistributing global power, generating new security threats, and granting an increasingly prominent role to states and large technology corporations. Based on a review of different definitions, it is argued that techno-diplomacy seeks to achieve foreign policy objectives, regulate strategic technologies, build alliances, influence international standards, and engage with non-state actors. Furthermore, the article highlights the need to incorporate the perspective of peripheral countries, whose priorities focus on technology transfer, the attraction of investment, the definition of standards, and capacity-building. Finally, it proposes an operational definition of techno-diplomacy applicable to different technologies and development contexts.

Introduction[1]

The international system is currently undergoing a series of rapid and far-reaching transformations, driven primarily by scientific and, above all, technological developments. These dynamics are fostering a significant redistribution of capabilities among major powers, while simultaneously contributing to a broader diffusion of power among states and emerging non-state actors.

Among these transformations, perhaps the most consequential is the consolidation of the sixth techno-economic paradigm—also referred to as the Fourth Industrial Revolution—which is centered on the development and diffusion of technologies such as digital platforms, artificial intelligence (AI), the Internet of Things (IoT), fifth-generation (5G) telecommunications infrastructure, nanotechnology, biotechnology, and innovations associated with the energy transition. Collectively, these technologies are accelerating what

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[1] This is the first in a series of documents that seeks to contribute to the study of the intersection between scientific and technological dynamics, foreign policy, and international relations. More specifically, it aims to enhance understanding of the European Union's techno-diplomatic strategy towards Latin America within the framework of its infrastructural initiative, Global Gateway.

has been termed the twin green and digital transitions.

As a result, emerging threats to the security and strategic autonomy of states—and increasingly of non-state actors such as technology corporations—are becoming ever more closely linked to technological change. Consequently, a growing number of countries have begun to formulate foreign policy strategies that explicitly incorporate technological dimensions. Within this context, the concept of "technodiplomacy" (also referred to in the European and Anglo-American literature as "tech diplomacy," "techplomacy," or, more broadly, "technological diplomacy") has gained renewed prominence in recent years. Broadly defined, technodiplomacy refers to the use of technology as a means of advancing foreign policy objectives. Although closely related to the concept of science diplomacy, technodiplomacy encompasses distinctive features stemming from the particular characteristics of technology as both a strategic asset and a domain of geopolitical competition.

This article seeks to contribute to the ongoing debate surrounding the reemergence of the concept of technodiplomacy. Given that the notion originated in, and has largely been theorized from the perspective of, developed countries—and that it remains strongly associated with digital technologies—the article aims to identify both the scope and the limitations of existing conceptualizations. It further proposes a complementary definition capable of transforming technodiplomacy into an analytical and operationalizable framework applicable to a broader range of technologies, whether traditional or emerging, and to countries occupying diverse positions within the international system, including both advanced and peripheral nations.

The article is organized as follows. The next section examines the distinction between science diplomacy and technodiplomacy, providing the rationale for privileging the latter concept. It then reviews the most influential contributions to the literature that have sought to define and conceptualize technodiplomacy from the late twentieth century to the present. The following section discusses perspectives and critical approaches emerging from peripheral countries regarding both the practice and the prevailing definitions of tech diplomacy. Finally, the concluding section advances a broader and more inclusive conceptual framework, designed to be analytically robust, operationalizable, and applicable across different technological domains and national contexts.

Why technodiplomacy and not science diplomacy

This article understands science as a social activity aimed at producing knowledge about the world through systematic and structured methods such as observation, experimentation, and reasoning, which may result in the formulation of general laws (RAE, 2026a). Technology, in turn, is understood as the practical application of scientific knowledge (RAE, 2026b). Admittedly, this sharp distinction has been increasingly challenged over recent decades, particularly because it is no longer possible to conceive of the relationship between science and technology as a unidirectional one—in other words, as technology merely constituting the practical realization of scientific advances. Rather, this article recognizes the mu-

tually reinforcing relationship between the two domains, whereby scientific breakthroughs enable technological innovation, while technological developments simultaneously expand the frontiers of scientific knowledge (Weiss, 2005).

Nevertheless, it is technology embodied in physical artifacts as well as in digital and cyber capabilities that generates concrete political and economic effects, both within states and across the international system (Muñiz, 2023). Technology possesses the capacity to profoundly reshape international relations insofar as it constitutes a major determinant of states' political, military, and economic power. In the contemporary international system, actors capable of mastering technologies such as AI or cyberspace acquire significant strategic advantages, whereas those unable to develop or access such capabilities risk falling into positions of relative vulnerability. As a result, technology has become a central concern of national security, compelling states to devise strategies to address emerging threats associated with the loss of competitive advantages in strategic technological sectors, disruptions to global supply chains supporting critical technologies, restrictions on access to markets for technologically sophisticated goods, the fragmentation of technological governance into competing standards regimes, vulnerabilities affecting critical infrastructures such as communications networks, data centres, and connectivity cables, or limited access to critical raw materials—including rare earth elements and strategic minerals—essential for sustaining the ongoing industrial transformation (Muñiz, 2023; González, 2026).

At the same time, large technology corporations have acquired unprecedented influence, increasingly competing with states themselves for control over data, digital platforms, and key technological infrastructures. Consequently, struggles over technological control and technological leadership can no longer be understood as exclusively interstate phenomena; they now involve a growing number of powerful non-state actors. Technology is also exerting a profound impact on the global economy by reshaping markets, transforming patterns of consumption, and concentrating economic activity in some regions while marginalizing others.

For these reasons, technology has become a matter of both national and corporate security, requiring states and technology corporations alike to formulate strategies capable of addressing threats associated with technological competition, supply chain vulnerabilities, market access restrictions, critical infrastructure protection, and access to the strategic resources necessary to sustain technological development and industrial upgrading (Muñiz, 2023; González, 2026).

Particularly relevant in this regard is the management and global diffusion of technology through technological standards. Standards constitute reference frameworks that embody considerable amounts of technical knowledge and know-how regarding specific artifacts and systems, while simultaneously serving as major determinants of trade flows and public policy outcomes (UNCTAD, 2003). Shared standards facilitate interoperability among goods and services produced by different manufacturers and enable firms to generate economies of scale and

operate in global markets. Consequently, states seek to shape standards in ways that align with the interests of their domestic industries and increasingly compete for influence within international standard-setting and governance bodies. Yet growing competition over the establishment of standards for emerging and disruptive technologies may also contribute to the formation of technologically fragmented spheres of influence that are "politically divided and potentially non-interoperable" (Feijóo González & Atienza Riera, 2023: 40).

Against this backdrop, it is reasonable to assume that diplomatic practices associated with the advancement of science (science diplomacy) and those linked to the development, deployment, and governance of technology (technodiplomacy) generate complementary yet distinct effects. Science diplomacy was famously defined by the Royal Society and the American Association for the Advancement of Science (AAAS) as a set of practices that can be grouped into three categories: science in diplomacy, whereby scientists provide expertise to support diplomatic negotiations; science for diplomacy, whereby scientific cooperation is used to improve relations among states; and diplomacy for science, whereby diplomatic action facilitates the international engagement of national scientific communities (The Royal Society, 2010).

In recent years, however, this framework has been widely criticized as overly naïve because it tends to depoliticize science and overlook the geopolitical interests that frequently underpin scientific cooperation and exchange (Fagërsten, 2022). Subsequent scholarship and policy developments have largely moved beyond this perspective, as reflected in the updated Royal Society/AAAS report (2025) and in the science diplomacy strategies adopted by the European Union, arguably the political entity that has engaged most extensively with the concept and formally incorporated it into its policy framework in May 2026. These recent documents acknowledge, first, that science diplomacy encompasses the "interactions between science and technology on the one hand, and international relations […] and diplomacy on the other," thereby subsuming technology within broader understandings of science diplomacy (European Commission, 2025: 18). Second, they recognize emerging perspectives that view science not merely as an instrument of cooperation and mutual understanding, but also as a domain of interstate competition and as a resource for pursuing foreign policy objectives serving both national and transnational interests (European Commission, 2025).

Yet, as Feijóo González and Atienza Riera (2023) observe, even though contemporary approaches increasingly acknowledge the geopolitical dimensions of science diplomacy, the concept still benefits from its association with notions of universal values and forms of knowledge. Technology, by contrast, is fundamentally concerned with the production, governance, and commercialization of artifacts and infrastructures that generate tangible economic and commercial consequences and involve not only states but also industries and, increasingly, powerful technology corporations. Consequently, the diplomatic practices that emerge from the development and

governance of technology—that is, technodiplomacy—are inherently more closely linked to power relations among states and other actors, making them more susceptible to geopolitical competition and global disputes.

For this reason, this article privileges the concept of technodiplomacy as a more suitable analytical lens through which to understand how contemporary geopolitical dynamics intersect with technological innovation and how such innovations, in turn, shape ongoing processes of power redistribution and diffusion within the international system. While acknowledging the close relationship between technodiplomacy and science diplomacy, the article emphasizes the distinctive nature of the former and argues that it warrants conceptual treatment in its own right.

Technodiplomacy: origins, evolution and contemporary understandings

One of the earliest references to the concept of technodiplomacy can be found in Schweitzer's 1989 book Techno-Diplomacy: US–Soviet Confrontations in Science and Technology. The author subsequently revisited and expanded upon the concept in an article published in Science & Diplomacy in 2019. In both works, Schweitzer recounts his experience implementing this strategy while serving as the first Science Officer appointed to the United States Embassy in the Soviet Union in the mid-1960s, at the height of the Cold War, when nuclear and space technologies constituted the primary technological security concerns (Schweitzer, 1989; 2019).

In his 1989 book, Schweitzer offers a broad definition of technodiplomacy by adapting a classification of diplomatic practices drawn from the Webster's Ninth New Collegiate Dictionary. According to the author, technodiplomacy consists of:

> (i) the art and practice of conducting negotiations between countries with conflicting interests; (ii) the ability to manage scientific affairs without provoking hostility; and (iii) the capacity to address issues at the frontiers of science and technology in ways that promote peace rather than war (Schweitzer, 1989).

Although this definition is sufficiently broad to encompass technological relations surrounding a variety of technologies—not only digital ones—and a wide range of countries, it remains of limited operational value because it does not specify which concrete activities should be considered technodiplomatic practices.

Despite these limitations, Schweitzer's account (1989; 2019) allows one to infer what he understood by technodiplomatic practice. Among the examples he discusses are cooperation programs and initiatives between the United States and the Soviet Union; participation in technology exchange programs; reciprocal visits by scientists from both countries; the establishment of parallel committees tasked with organizing meetings on science and technology issues, particularly those related to international security and arms control; and the creation of shared institutional spaces aimed at fostering the governance of specific technologies.

Other activities that may likewise be interpreted as technodiplomatic practices were associated with the opportunities that the United States identified for its strategic technology industries and firms within the Russian market, particularly

from the 1990s onward. One illustrative example was the involvement of Boeing with leading Russian universities, which ultimately led to the establishment of a research centre that later evolved into a computer design hub. Similarly, Westinghouse Electric established a local subsidiary to collaborate on nuclear reactor design. In addition, the United States–Russia Business Council was created and, for decades, worked to identify attractive niche markets, with several technology firms participating among its members (Schweitzer, 2019). These examples highlight one of the defining features of technodiplomacy: its close relationship with productive sectors, industry, and private actors.

Accordingly, the range of actors considered relevant to technodiplomacy by Schweitzer extends well beyond traditional diplomatic institutions. It includes state scientific and technological agencies—such as the United States Department of Energy and the Soviet State Committee for Atomic Energy—as well as universities and research centres. Equally important, however, are strategic technology firms and industrial actors, whose participation occupies a central place within his understanding of technodiplomatic practice (Schweitzer, 1989; 2019).

Likewise, when identifying the objectives of these practices, Schweitzer's analysis ultimately extends beyond the broad definition presented above, as the goals of technodiplomacy become contingent upon the specific country that formulates and implements them. For instance, he argues that, for the United States, the objectives of such strategies include: i) advancing global science; ii) strengthening American scientific capabilities; iii) maintaining an advantage over Russian capabilities; iv) supporting the development of the global scientific community; and v) contributing to solutions for global challenges. For Russia, by contrast, the objectives associated with these policies were primarily related to: i) keeping abreast of the latest developments in civilian science; and ii) securing additional resources to support domestic research efforts (Schweitzer, 1989; 2019). In other words, differences in countries' relative levels of development—and, consequently, in the sophistication of their scientific and technological ecosystems—give rise to distinct technodiplomatic strategies.

One of the most noteworthy contributions found in Schweitzer (1989) is that, as early as the 1980s, the author recognized the capacity of the scientific and technological sector to shape the transformations taking place in the international economy, particularly in the field of microelectronics, which was then undergoing a profound revolution[2]. In this regard, he argued that:

> "those countries that can obtain and use information on a global scale will be the true masters of their economic future [...]. The information standard—reflected in the power and compatibility of computer systems—has replaced the gold standard as the basis for international trade" (Schweitzer, 1989: ix).

This observation not only anticipated the future prominence of computing and in-

[2] In fact, some argue that the sixth techno-economic paradigm is actually a continuation of the fifth paradigm, which developed on the basis of advances in microelectronics and computing

formation technologies but also underscored the centrality of technological standards in technological competition. As argued above, the governance and contestation of standards constitute a defining concern of technodiplomacy and one that clearly distinguishes it from science diplomacy.

At the same time, some limitations can also be identified in Schweitzer's work. Although he proposes a broad definition of technodiplomacy that, as noted, can be applied to the study of virtually any technology and national context, this breadth comes at the expense of analytical precision and operationalizability. Moreover, the author does not clearly distinguish between the specific characteristics of science and technology, often employing the terms interchangeably and without clear differentiation. Indeed, he frequently privileges references to science when describing practices that he himself characterizes as technodiplomatic (Schweitzer, 1989; 2019).

More recently, Silveira Pereyra (2017) has also employed the concept of technodiplomacy, adopting Schweitzer's (1989) definition to analyze the installation and expansion of railways in Portuguese colonies in Africa. However, Silveira Pereyra broadens the concept by offering another general definition, consistent with those discussed above, according to which technodiplomacy can be understood as "a practice that enables countries to achieve diplomatic objectives through the use of technology" (Silveira Pereyra, 2017). Put differently, technodiplomacy is conceived as the practice of diplomacy through technological means.

These latter definitions are, in turn, strongly inspired by Gabrielle Hecht's notion of "technopolitics." According to Hecht (2009, p. 15), technopolitics refers to "the strategic practice of designing or using technology to constitute, embody, or enact political goals." Importantly, Hecht adopts a broad understanding of technology, one that encompasses not only technological artefacts themselves but also systematic and non-material methods of making and doing things (Hecht, 2009).

As in the previous cases, Silveira Pereyra's definition remains excessively broad and does not lend itself easily to operationalization, although it offers the advantage of being applicable to the study of a wide range of technological sectors. Moreover, because it is explicitly inspired by Hecht's notion of technopolitics, which conceptualizes technology from a broad perspective as a sociotechnical assemblage, this approach creates an important bridge between the discipline of International Relations—and, more specifically, Foreign Policy—and fields concerned with the study of technology and technological change (Vera, 2021).

For her part, the author of this article—drawing on the aforementioned definitions—previously argued that technodiplomacy manifests itself through the use of science and technology as resources of power and as instruments for cooperation and the expansion of regional and global influence through the projection of prestige and international standing (Vera, 2020). In terms of the practices that could be encompassed within technodiplomacy, this characterization included technology cooperation and transfer agreements, ex-

changes of technical personnel, the development of joint technological projects, the adoption of coordinated diplomatic positions in defense of interests related to specific technologies, and confidence-building measures. Although this description was relatively broad—and to some extent applicable to the study of diverse technologies—it lacked sufficient conceptual refinement, thereby preventing a clear categorization of the different activities involved (Vera, 2020).

More recently, Jorge Ricart (2021a; 2021b) has contributed extensively to discussions surrounding the definition of technodiplomacy. One of the most salient features of his work is the growing prominence accorded to digital technologies. Furthermore, her examination of technodiplomatic strategies within the context of contemporary technological competition allows for several analytical insights. First, she identifies a set of strategic technologies and critical inputs that have become central to ongoing technological rivalries. Among the former are green and digital technologies, including AI, the Internet of Things, data infrastructures, cryptocurrencies, blockchain technologies, 5G networks, and strategic infrastructures such as satellites, submarine cables, and autonomous lethal weapons systems. Among the latter are critical raw materials and inputs, including lithium, rare earth elements, batteries, and semiconductors (Jorge Ricart, 2021a; 2021b).

Within this context, Ricart emphasizes the importance of developing strategic technologies and prevailing in the race to shape regulatory and normative frameworks. This emphasis once again highlights the centrality of technological standards and their close connection to broader struggles for technological leadership and control over strategic sectors. Second, she argues that technodiplomatic strategies cannot be separated from domestic industrial and technological policies, a characteristic that helps explain the inherently "intermestic" nature of technodiplomacy, situated at the intersection of domestic and international political dynamics (Jorge Ricart, 2021a; 2021b).

Nevertheless, one of the principal limitations of Ricart's reflections lies in the absence of a fully developed and operationalizable definition of technodiplomacy. As she herself acknowledges, there is currently no academic or institutional consensus regarding the meaning of the concept (Jorge Ricart, 2021b). Yet this ambiguity may also provide certain advantages, as it affords states greater flexibility when designing their own technodiplomatic strategies. Indeed, implicitly echoing Schweitzer's (1989) earlier observations, Ricart argues that states formulate these policies in accordance with their particular objectives and interests. Consequently, technodiplomatic strategies are likely to vary depending on factors such as a country's capabilities, position within the international system, and broader national goals (Jorge Ricart, 2021b).

In 2023, Torres Jarrín and Riordan published a comprehensive volume devoted to the discussion and conceptualization of science diplomacy and technodiplomacy (or *techplomacy*, as they prefer to call it), particularly in the context of relations between the European Union and Latin America. Like Jorge Ricart (2021a; 2021b) and other scholars, the authors

primarily associate technodiplomatic practice with digital technologies. For this reason, they characterize technodiplomacy as a novel phenomenon, despite the fact that the term itself predates the widespread diffusion of digitalization. As a consequence of this focus, they also emphasize the growing relevance of a new category of geopolitical actors: technology corporations, particularly those involved in the development of strategic technologies and in the management and provision of internet connectivity infrastructure (Torres Jarrín & Riordan, 2023).

Accordingly, the definition of technodiplomacy advanced by Torres Jarrín and Riordan (2023) centers on the ways in which diplomatic practice engages with digital technology corporations. This perspective reflects the extent to which such companies have become geopolitical actors in their own right, as well as the degree to which digital technologies are increasingly shaping arenas of competition both among states and between states and these emerging actors. Within this framework, the authors identify two principal objectives that any technodiplomatic strategy should pursue: first, minimizing and managing rivalries in ways that prevent further technological fragmentation; and second, reflecting on how states should engage with technology corporations in light of their growing geopolitical significance (Torres Jarrín & Riordan, 2023).

Muñiz (2023) and Bjola and Kornprobst (2025), for their part, have contributed to expanding the understanding of technodiplomacy by distinguishing it from other related yet conceptually distinct practices, including science diplomacy, digital diplomacy, cyber diplomacy, and data diplomacy. According to Muñiz (2023), technodiplomacy is primarily concerned with the regulation and governance of emerging technologies -and therefore encompasses more than digital technologies alone, offering a broader conception of the practice- as well as with understanding and addressing the societal implications of technological change. Science diplomacy, by contrast, seeks to support national scientific communities and enhance opportunities for collaboration with foreign partners, thereby contributing to innovation. Digital diplomacy, in turn, refers to the use of digital technologies in the conduct of diplomatic activities, including practices such as the digitalization of consular services or the use of social media platforms as communication tools by foreign ministries (Muñiz, 2023).

Bjola and Kornprobst (2025) likewise argue that technodiplomacy possesses two defining characteristics. First, it is inherently dynamic because it evolves alongside technological change and in response to the demands and challenges associated with the new techno-economic paradigm. As a result, technodiplomacy constitutes a strategy aimed at creating balances between domestic realities and the consequences generated by the rapid diffusion of technology. Second, it is polylateral in nature. Rather than focusing exclusively on interactions among the traditional actors of international relations, technodiplomatic practice involves engagement with technology corporations, intergovernmental and supranational organizations, civil society actors, scientific and technological communities, subnational

authorities, and a variety of other stakeholders (Bjola & Kornprobst, 2025).

In this regard, Bjola and Kornprobst (2025) distinguish technodiplomacy from digital diplomacy, cyber diplomacy, data diplomacy, and science diplomacy. Digital diplomacy is defined in terms similar to those proposed by Muñiz (2023), namely as the use of digital technologies in the conduct of diplomatic activities. Cyber diplomacy, by contrast, focuses primarily on cybersecurity issues and tends to involve a narrower, albeit more specialized, set of actors than technodiplomacy. Data diplomacy addresses questions related to information, data governance, and privacy.

As for the difference between technodiplomacy and science diplomacy, the authors argue that the former is simultaneously broader and narrower in scope. It is broader because it encompasses a diverse range of actors, including technology corporations, international organizations, civil society groups, scientific and technological communities, and subnational governments, whereas science diplomacy tends to focus primarily on relations among states and their scientific communities. At the same time, technodiplomacy is narrower in terms of its substantive focus. While science diplomacy draws upon a wide range of disciplines and forms of expertise, technodiplomacy concentrates specifically on technological issues, and more precisely on technologies deemed strategic in economic, political, or security terms (Bjola & Kornprobst, 2025).

Ultimately, for these authors, digital diplomacy revolves around the power of information -that is, the capacity to disseminate and control information through digital channels, shape public opinion, and influence diplomatic outcomes. Science diplomacy, in turn, is centered on the power of knowledge, leveraging scientific expertise to inform and shape public policy agendas. Technodiplomacy, by contrast, focuses on the innovation, regulation, and integration of technology into diplomatic practice. Within this framework, what fundamentally distinguishes technodiplomacy from other diplomatic modalities is that the power of innovation inherent to technology actively drives change in international structures rather than merely responding to it (Bjola & Kornprobst, 2025).

That said, thus far, the discussion has focused primarily on material understandings of technodiplomacy, emphasizing its economic, technological, and security dimensions -dimensions whose effects can, at least in principle, be measured and assessed. Yet the concept has also been examined from a more ideational perspective. Mashiah (2023), for example, while acknowledging the material consequences of technodiplomacy, places greater emphasis on its role in shaping perceptions, influence, and subjectivities. According to this view, technodiplomacy can contribute to diplomatic efforts by functioning as a rhetorical instrument through which particular images of technology are constructed and projected. In doing so, it enables states to cultivate specific international identities, extend influence, and shape external perceptions of themselves (Mashiah, 2023).

The novelty of this perspective lies in its emphasis on narrative construction. From

this standpoint, the essence of technodiplomacy resides in the creation and dissemination of narratives surrounding technological products, technology corporations, and entrepreneurs in ways that advance a country's foreign policy objectives (Mashiah, 2023).

Indeed, this appears to be the conception of technodiplomacy most strongly reflected in contemporary Chinese thinking on the subject. Whereas the discussion reviewed thus far has drawn primarily upon Western scholarship, Huang and Meng (2025) demonstrate that China has both extensively employed and theorized the concept. In contrast to much of the Western literature, Chinese approaches tend to subsume science diplomacy within the broader category of "technology diplomacy," while simultaneously conceptualizing technodiplomacy not merely as a mechanism for cooperation but also as a strategic instrument of international power. Chinese scholars reinterpret the concept through a more competitive lens, arguing that Western technological discourse has historically been dominant and has often sought to constrain China's technological development. In response, China has sought to redefine technodiplomacy in ways that legitimize its own model of scientific and technological development while strengthening its position within the international system (Huang & Meng, 2025).

From this perspective, technodiplomacy emerges as a tool for shaping international narratives and projecting influence across strategically significant regions and issue areas. Beyond facilitating technological cooperation or governance, it becomes a mechanism through which states seek to construct legitimacy, contest dominant discourses, and advance their geopolitical interests in an increasingly technology-driven international order (Huang & Meng, 2025).

In other words, technology is understood as a means of influencing global rules governing science, innovation, and technological governance. This is reflected in recent diplomatic initiatives, such as multilateral agreements in which China promotes notions of "joint governance" of science and expresses opposition to supply chain fragmentation or "decoupling." Ultimately, this agenda seeks to enhance China's technological autonomy, strengthen its discursive power within the international system, and position the country as a central actor in the definition of global rules in science and technology.

From a more comprehensive perspective - one that incorporates both material and ideational dimensions- Cotroneo and Csernatoni (2025: 4) define technodiplomacy both as a bilateral approach and as a relational and constitutive practice in which states, institutions, and companies co-create the architectures, norms, and strategic imaginaries that govern emerging sociotechnical systems. In other words, they recognize technodiplomacy as having a profoundly transformative capacity in international relations insofar as it:

> institutionalizes multistakeholder dialogue, leverages regulatory power as a de facto soft infrastructure, and seeks to stabilize contested digital orders amid great power technological rivalry (Cotroneo & Csernatoni, 2025: 4).

Consistent with much of the recent literature, the authors emphasize the agency of

technology corporations and the centrality of their agendas and interests within technodiplomatic practice, while primarily focusing on digital, emerging, and disruptive technologies.

At the same time, and similarly to Munro (2024), they acknowledge the security-related dimensions of this practice and the role of geopolitical contestation in the implementation of technodiplomatic strategies. However, such considerations tend to remain secondary in their analysis, which instead prioritizes engagement with technology corporations and the governance of digital technologies.

In contrast, Munro (2024) defines technodiplomacy as technological collaboration across multiple sectors and among various countries, and as a key instrument for securing strategic alliances -particularly with major technological powers- in order to remain up to date with technological advancements and maintain competitiveness vis-à-vis adversaries, thus emphasizing the competitive and security-related aspects. He also conceptualizes technodiplomacy as a tool to enhance the commercialization of technological goods and services and to support the establishment of technological standards and norms.

Ultimately, for Munro, technodiplomacy combines expertise from three traditionally separate domains -the technological, the commercial, and foreign policy- in order to integrate within a single strategic framework the promotion of technological innovation, the capacity to commercialize and deploy research outputs, and the competencies required to achieve international security and governance objectives. Through these practices, technodiplomacy can reshape alliances in ways that align with security needs while also enabling the development and commercialization of research and innovation outputs.

This conception is particularly notable not only for foregrounding the role of technodiplomacy within the security agenda, but also for its empirical grounding in Australia -a country that, while not considered peripheral, is nonetheless directly affected by the structural tensions arising from the strategic competition between the United States and China.

In a complementary vein, Cotroneo and Csernatoni (2025) argue that a technodiplomatic strategy also involves the development of approaches capable of navigating asymmetric interdependence, the dilemmas associated with the diffusion of technological standards, and competing visions of technological sovereignty. In this sense, technodiplomacy is understood as a practice embedded in a broader landscape of structural constraints and normative contestation.

Finally, for a more comprehensive analysis of technodiplomatic strategies and practices, it is useful to draw on the contribution of Bjola and Kornprobst (2025), who introduce what they term an “analytical triangle.” This framework assigns each vertex to a specific dimension necessary for the integrated analysis of technodiplomatic dynamics.

The first vertex focuses on the specificities of the technology under examination, including its technical characteristics and the consequences derived from those

properties. The second addresses agency, and involves identifying the actors engaged in the development and deployment of a given technology -such as scientists, engineers, states, and technology corporations- as well as the nature of their interactions. The third vertex concerns order, understood as the broader geopolitical and economic context in which a technology is embedded, including the distribution of capabilities among actors, the structure of their relationships, the presence of asymmetries or colonial legacies, and the role of multilateral institutions and governance arrangements that regulate the technology under analysis (Bjola & Kornprobst, 2025).

Taken together, this analytical framework allows for a comprehensive understanding of the specificities of any given technology -whether emerging or established- along with the constellation of actors involved in its development and the broader structural context in which it unfolds, thereby illuminating the underlying power dynamics that shape it.

Against this backdrop, it is useful to complement this discussion with the work of Moore Aoki (2026), who proposes a preliminary classification for technodiplomatic strategies that can be applied to categorize emerging practices identified through the aforementioned analytical triangle. In this regard, the author makes a significant contribution by offering an initial typology of technodiplomatic strategies and practices grouped into three categories:

(i) *Governance*, which refers to the shaping of the rules governing a technological sector and the negotiation of norms, standards, security measures, and public policy frameworks for emerging technologies;

(ii) *Engagement*, which encompasses diplomatic interaction with a wide ecosystem of actors, including technology corporations, states, platforms, laboratories, investors, civil society organizations, international organizations, among others;

(iii) *Strategic technological statecraft*, which refers to "the deployment of infrastructure, standards, public digital infrastructure, international hosting arrangements, innovation hubs, regulatory environments, and digital capacity as instruments of diplomatic influence, alliance-building, trust generation, resilience, and geopolitical positioning" (Moore Aoki, 2026: 7).

This final category constitutes the author's distinctive contribution, as it conceptualizes technology itself as a strategic diplomatic instrument. In other words, it can be broadly understood as diplomacy through technology, insofar as infrastructures, standards, and digital capabilities are mobilized as tools of geopolitical positioning as well as material and symbolic power.

The analytical value of this typology is significant for several reasons. First, although it is primarily designed to analyze practices associated with digital and emerging technologies, it remains sufficiently broad and flexible to be applied to a wider range of technological domains. Second, it provides a clear categorization of technodiplomatic practices that captures both cooperative dimensions and more competitive dynamics associated

with an increasingly contested geopolitical environment.

One limitation, however, is that it remains largely grounded in perspectives derived from developed contexts, potentially overlooking technodiplomatic practices and objectives that may be prioritized in peripheral settings. Addressing these gaps is the focus of the following section.

Technodiplomacy at the margins: voices from the Periphery

While technodiplomatic strategies in major powers are primarily oriented toward managing security threats -such as securing global supply chains, preserving or enhancing technological autonomy, opening markets for domestic technological products, and ensuring access to critical mineral reserves and rare earth elements- for less powerful countries, an appropriate technodiplomatic strategy may entail comparatively less ambitious objectives, more closely linked to the development of domestic capabilities.

Eugenio V. García, Brazil's technological ambassador, advocates for a situated technodiplomatic perspective that amplifies peripheral voices, arguing that, as a socially constructed phenomenon, technology cannot be considered neutral or impartial (García, 2025). Within this framework, he questions the extent to which the economic, technological, and commercial priorities of major powers in the current geotechnological contest take into account the interests and objectives of developing and less developed countries that constitute the global periphery.

In this context, peripheral regions face significant difficulties in navigating the ongoing industrial transformation and an increasingly fragmented international technological system. First, these difficulties stem from the widening gap between peripheral and advanced countries, driven by deficits in adequate digital infrastructure, outdated communication networks, limited computational capacity, unequal access to internet connectivity, shortages of highly skilled human capital, and insufficient investment in science, technology, and innovation systems.

Second, the growing prominence of technology corporations -often headquartered in major powers- tends to reproduce and deepen existing asymmetries of power, while also generating new forms of structural dependency and, in some cases, neocolonial relations. In this sense, peripheral territories frequently become large-scale data and resource reservoirs supplying the natural resources required for the production of critical inputs for digital infrastructures in advanced economies (De Angelis, Vera & López, 2025). Moreover, as García (2025) notes, populations in these regions are often employed at low wages to train AI systems developed in core countries, which rely on algorithms embedded with racial and gender biases and are primarily designed for English-speaking users and contexts characterized by higher levels of development. It is also worth noting that the peripheral regions that provide both material and human resources to technology corporations are largely excluded from the decision-making processes that govern the technologies that ultimately affect them.

Finally, developing countries are frequently caught in the geopolitical tensions between major powers when forced to

choose between competing technological standards or pathways for technology adoption and importation.

Taken together, these dynamics underscore the structural constraints faced by peripheral actors in the global technodiplomatic landscape and highlight the need to reconsider technodiplomacy not only as an instrument of power in core countries, but also as a potentially asymmetrical field of negotiation, contestation, and limited agency in the global South.

The adoption of technological standards has a particularly significant impact on peripheral regions, since, as several authors have noted (Torres Jarrín & Riordan, 2023; García, 2025; González, 2026), decisions regarding which standards to adopt may substantially constrain their policy space due to the explicit or implicit diplomatic pressure exerted by major powers. In this regard, González (2026) argues that standards shape the future development of key technologies and transform territories -particularly those located in the periphery- into the object of "silent but decisive" disputes. At the same time, while major powers compete in international forums to secure primacy in standard-setting processes, peripheral voices tend to be marginalised. This asymmetry may translate into widening development gaps, higher technological adoption costs, and reduced capacity to integrate advanced technologies into domestic productive structures.

These issues have been a longstanding concern of the United Nations Conference on Trade and Development (UNCTAD), which has reflected on them since the early twenty-first century (and even earlier), given that one of its core historical mandates has been to strengthen the capacity of peripheral countries to participate in international negotiations related to trade, technology, and global standard-setting processes.

In a 2003 report on the practice of what it terms science and technology diplomacy, UNCTAD highlights the close relationship between technology, international trade, and regulatory capacity (i.e., standard-setting). From the perspective of peripheral countries, the report acknowledges that one of the central concerns lies in how international agreements may constrain their policy space for implementing industrial, productive, and innovation policies, particularly in contexts marked by increasing global integration and high levels of technological concentration.

Furthermore, the report notes that existing international rules often limit technology transfer -a longstanding demand of peripheral countries in their relations with advanced economies (UNCTAD, 2003). According to the organization, at least three major constraints restrict opportunities for innovation and technological learning: i) tariffs; ii) restrictions on the importation of technologies embedded in machinery and equipment; and iii) the vulnerability of peripheral exports to changes in international standards -particularly sanitary and phytosanitary standards- which frequently operate as non-tariff barriers (UNCTAD, 2003).

In this sense, a direct relationship is established between technological capacity and regulatory capacity, insofar as the historical inability of peripheral countries to actively participate in the formulation of

international standards has positioned them predominantly as *standard takers* rather than *standard makers*. It is precisely in this context that, according to this organization, technodiplomacy becomes relevant as an instrument for expanding the capacity of these countries to exert influence over global technological governance and over the rules that structure international trade and innovation.

For this reason, UNCTAD also identifies several areas of particular relevance for peripheral technodiplomacy, organized around three key dimensions.

First, it highlights international arrangements related to technology transfer and foreign direct investment (FDI). For peripheral countries, access to technologies that can strengthen processes of economic and social development is of fundamental importance. However, technology transfer through FDI does not occur automatically; rather, it depends on national policies aimed at technological absorption, the development of local capabilities, and long-term strategic planning. In this context, technodiplomacy emerges as a key instrument for negotiating mechanisms that facilitate technology transfer without discouraging foreign investment.

Second, UNCTAD emphasizes the management of technological risks, market access, and the definition of international standards as priority areas. Exporting countries are required to comply with standards that are often established by core economies; however, these regulatory requirements -particularly in sanitary, environmental, or technical domains- frequently pose significant challenges for peripheral states. While in the early 21st century UNCTAD's concerns were primarily focused on environmental requirements and the emerging trade in green technologies, these observations are today equally applicable to digital technologies and the governance of emerging technological systems.

Finally, UNCTAD also points to the capacity to build technological alliances aimed at reducing risks, sharing capabilities, and strengthening bargaining positions. Although this notion originally refers to alliances among technology firms, it can also be extended to coalitions among states or between public and private actors. For peripheral countries, the possibility of forming such technological alliances represents a particularly valuable instrument for enhancing negotiating capacity, reducing structural dependencies, and participating more actively in global technological governance (Munro, 2024). When these alliances are established with major technological powers, they may also provide access to financing, knowledge, and technological capabilities that would otherwise remain unavailable. However, such arrangements also carry the risk of locking peripheral actors into asymmetric or constraining coalitions (Munro, 2024).

Taken together, the concerns of peripheral countries partially overlap with those of major powers, but they are not identical; consequently, their technodiplomatic strategies differ accordingly. This is consistent with the understanding that technodiplomacy constitutes an "intermestic" policy domain, in which the external projection of technological diplomacy reflects the domestic configuration of science, technology, and innovation capaci-

ties (Jorge, 2021b). It is therefore reasonable to argue that, in the case of peripheral countries, reflections on technodiplomacy tend to focus primarily on strategies aimed at building or strengthening domestic technological capabilities that are otherwise lacking.

Accordingly, their main objectives revolve around securing technology transfer and attracting FDI, engaging in discussions on standards whose adoption does not impose disproportionate costs or hidden barriers, and accessing potential technology markets in major economies in ways that could help rebalance historically asymmetric trade structures based on the export of raw materials and the import of industrial goods.

In other words, *debates on technodiplomacy originating in technologically advanced countries often fail to fully acknowledge that, in peripheral contexts, technodiplomatic strategies are primarily oriented toward the construction of domestic capabilities rather than toward geopolitical positioning or the pursuit of technological dominance over strategic sectors.*

This does not imply that developed countries do not share certain objectives with peripheral states, nor that they do not seek to use technodiplomacy to strengthen their own domestic capabilities, particularly in the context of intensifying technological competition. Indeed, as Moore Aoki (2026) argues, the categories she proposes are not watertight compartments but rather analytically distinct yet empirically overlapping domains with blurred boundaries. In this sense, standard-setting negotiations may fall within the domain of governance; however, when they are deployed to create markets dependent on specific technological products and to exclude competitors, they become instruments of geopolitical positioning and should therefore be understood as forms of strategic technological statecraft. Similarly, while cooperation aimed at securing funding for technological research may be classified as engagement, in the case of peripheral countries it may acquire a more strategic dimension, closely linked to the objective of building domestic capabilities.

Building on this argument, this article proposes an extension of Moore Aoki's typology through the incorporation of a fourth category that may be termed *technological capacity-building*. This category refers to the deliberate development of domestic technological capabilities as a core objective of technodiplomatic practice. Importantly, this is not a category exclusive to peripheral countries, as it is increasingly relevant in the current context of intensified technological competition. Indeed, it appears to underpin recent European initiatives aimed at increasing the production of critical technological inputs, such as the Chips 2.0 strategy. However, as an analytical category, it is particularly useful for capturing the needs of peripheral countries, whose technodiplomatic objectives and strategies vary significantly depending on the relative weakness of their science, technology, and innovation systems and their structurally constrained position within the contemporary technological order.

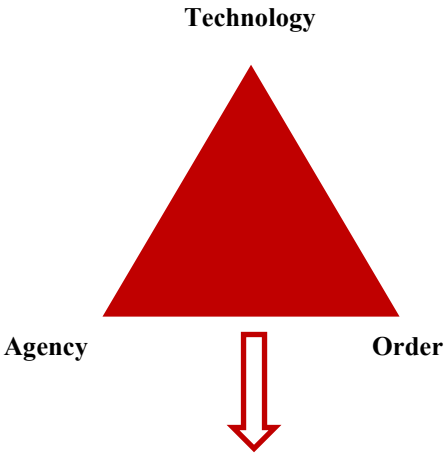
Technodiplomacy as a Strategy and as an Analytical Tool

In order to develop a broad and encompassing definition of technodiplomacy capable of describing and analyzing a wide range of technologies-traditional, new, emerging, and disruptive- and, at the same time, applicable to contexts characterized by varying levels of development, this article proposes understanding technodiplomacy as *a set of practices grounded in the use of technology for the pursuit of foreign policy objectives. These objectives may be oriented either toward cooperation or toward the pursuit of greater security; they may target states or non-state actors such as technology corporations; and they vary depending on the relative level of development and the geopolitical position of the actors implementing them.*

As illustrated in Figure 1, diverse technodiplomatic strategies can be more comprehensively understood through the application of an analytical triangle (Bjola & Kornprobst, 2025) that examines: i) the specificities and technical characteristics of a given technology (nuclear, space, digital, among others), including the knowledge systems, infrastructures, and components that constitute it; ii) the actors involved (state, private, civil, and military actors), as well as the nature of their interactions; and iii) the broader order or context in which these technologies are developed and deployed, thereby highlighting the distribution of technological capabilities among actors and the asymmetrical, competitive, or even colonial relations that structure them.

Within this framework, it becomes possible to more clearly identify which types of technodiplomatic strategies are deployed by different actors and in relation to different technological domains. These may include practices of engagement, governance, strategic technological statecraft (Moore Aoki, 2026), or technological capacity-building, depending on the objectives pursued and the structural conditions in which such strategies are embedded.

FIGURE 1. Methodological and Operational Framework of Technodiplomatic Strategies



Technodiplomatic Strategy	Practices Involved
Engagement	Diplomatic engagement with a broad ecosystem of actors, including technology corporations, states, digital platforms, research laboratories, investors, civil society organizations, and international organizations.
Governance	Shaping the rules governing technological sectors and negotiating regulations, norms, standards, security measures, and public policy frameworks for emerging technologies.
Strategic Technological Statecraft	The deployment of infrastructure, standards, digital public infrastructure, international hosting arrangements, innovation hubs, regulatory environments, and digital capabilities as instruments of diplomatic influence, alliance-building, trust creation, resilience enhancement, and geopolitical positioning.
Technological Capacity-Building	Negotiating technology transfer agreements, securing financing, and attracting foreign direct investment (FDI) in technology-intensive sectors to foster the development and strengthening of domestic technological capabilities and industries.

Author's own elaboration based on Bjola & Kornprobst (2025) and Moore Aoki (2026).

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References

BJOLA, C. & KORNPROBST, M. (2025). Studying Tech Diplomacy – Introduction to the Special Issue on Tech Diplomacy to be published in Global Policy, 1–8. https://doi.org/10.1111/1758-5899.70035

COTRONEO, C., & CSERNATONI, R. (2025). "Tech diplomacy 2.0: Examining the intersections between industry and governments in international relations". *International Journal of Cyber Diplomacy*. https://ijcd.ici.ro/documents/61/Art._C._Cotroneo_R._Csernatoni.pdf

DE ANGELIS, I.; VERA, N. & LOPEZ, M. P. (2025). "Más allá del desarrollo: seguridad y derechos humanos en las grandes iniciativas globales de infraestructura e inversión en América Latina". En Crespo Alcázar, A. y Pazos Seoane, M. (Coords.). *Vigilancia y cumplimiento de los derechos humanos en un mundo en cambio* (pp. 79-114). Editorial Dykinson. España.

EUROPEAN COMMISSION (2025). European Framework for Science Diplomacy. Recommendations of the EU Science Diplomacy Working Groups.

FÄGERSTEN, B. (2022). *Leveraging Science Diplomacy in an Era of Geo-Economic Rivalry*. The Swedish Institute of International Affairs, 1: 22.

FEIJÓO GONZÁLEZ, C. & ATIENZA RIERA, J. M. (2023) "Diplomacia tecnológica y geopolítica multipolar. Una revisión de cuestiones claves". *Economía Industrial, Dossier: Soberanía Tecnológica e Industrial*. 427: 33-44.

GARCÍA, E. V. (2025). "Technology for Whom and for What? A Global South View of Tech Diplomacy". En *Global Policy. Special Issue: Tech Diplomacy: Technology, Agency, Order*, 0: 1-9. https://doi.org/10.1111/1758-5899.70024

GONZÁLEZ, J. (2026). "Diplomacia, tecnología y poder: cómo la competencia tecnológica redefine la política exterior española". En *The Diplomat Spain*. https://thediplomatinspain.com/2026/01/08/analisis-diplomacia-tecnologia-y-poder-como-la-competencia-tecnologica-redefine-la-politica-exterior-espanola/

HECHT, G. (2009). *The radiance of France. Nuclear power and national identity after World War II*. Massachusetts: MIT Press.

HUANG, Z. A. & MENG, X. (2025). "China's Strategic Approach to Tech Diplomacy in a Time of Global Uncertainty". En *Global Policy. Special Issue: Tech Diplomacy: Technology, Agency, Order*, 0: 1-12. DOI: https://doi.org/10.1111/1758-5899.70038

JORGE RICART, R. (2021a) "Hacia una nueva línea de acción exterior tecnológica en España y Europa". En *Real Instituto El Cano, ARI 16/2021*, 4 de febrero de 2021.

— (2021b) "Europa busca su diplomacia tecnológica: por qué están en juego soberanía y derechos y en qué te afecta, según esta prestigiosa politóloga". En *Business Insider España,* 21 de junio de 2021. https://www.businessinsider.es/politica/diplomacia-tecnologica-como-sera-europa-como-te-afecta-884343

MASHIAH, I. (2023). "Tech-Diplomacy: High-Tech Driven Rhetoric to Shape National Reputation". *E-International Relations*. https://www.e-ir.info/pdf/103744

MOORE AOKI, A. (2026). *From diplomacy about technology to diplomacy through technology: A three-dimensional framework for tech diplomacy.* Tech Diplomacy Global Institute. https://doi.org/10.5281/zenodo.19254226

MUNRO, B. (2024). Tech diplomacy: What it is, and why it's important. *The Strategist*. https://www.aspistrategist.org.au/tech-diplomacy-what-it-is-and-why-its-important/

MUÑIZ, M. (2023) Diplomacia tecnológica para la era digital. En *Revista CIDOB d'Afers Internacionals* 134: 91-102.

REAL ACADEMIA ESPAÑOLA (2026a). "Ciencia" https://dle.rae.es/ciencia

— (2026b). "Tecnología" https://www.rae.es/desen/tecnolog%2525C3%2525ADa

SCHWEITZER, G. (1989). *Techno-diplomacy: US – Soviet Confrontations in Science and Technology*. New York: Springer.

— (2019). "Evolution, Impacts, and Promise of U.S.-Russian Techno-Diplomacy" *Science & Diplomacy*, 8(2) (December 2019). http://sciencediplomacy.org/article/2019/evolution-impacts-and-promise-us-russian-techno-diplomacy

SILVEIRA PEREIRA, H. (2017). "Especulação, tecnodiplomacia e os caminhos de ferro coloniais entre 1857 e 1881". *História. Revista da FLUP*, 7, pp. 137-162.

THE ROYAL SOCIETY AND THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE (AAAS) (2010). New Frontiers in Science Diplomacy: Navigating the Changing Balance of Power, enero. https://www.aaas.org/sites/default/files/New_Frontiers.pdf.

TORRES JARRÍN, M. & RIORDAN, S. (2023). *Science Diplomacy, Cyber-diplomacy and Techplomacy in EU-LAC Relations*. Springer.

UNCTAD (2003). Science and Technology Diplomacy. Concepts and Ele-

ments of a Work Programme. United Nations. https://unctad.org/system/files/official-document/ itetebmisc5_en.pdf

VERA, N. (2020). "Tecnodiplomacia, o cuando la ciencia y la tecnología se convierten en herramientas de paz: el caso de la cooperación nuclear entre Argentina y Brasil en el siglo XX". *Mural Internacional* 11.

— (2021). "Ciencia, tecnología y Relaciones Internacionales: visibilizar la simbiosis". COLOMBO, S. (Comp.): *Desarrollo y políticas de ciencia, tecnología e innovación en un mundo en transformación. Reflexiones sobre la Argentina contemporánea*. Pp.: 181-214. Tandil: CEIPIL-UNICEN.

WEISS, C. (2005). "Science, technology and International Relations". *Technology in Society* 27: 295–313.

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