Diego Lawler

Standards and power

Abstract: Standards are foundational elements that structure the artificial world, influencing the ontological, epistemological, normative, and axiological dimensions of human life. As technical artifacts, they regulate interactions, delineate permissible actions, and subtly distribute power within complex sociotechnical networks. Although often invisible in everyday experience, standards reflect and perpetuate the interests of dominant actors, becoming deeply embedded in global systems and societal values. This article critiques the functionalist perspective on standards and introduces a philosophical framework that positions them as artifacts inseparable from power dynamics. It examines how standards function as instruments of governance and control, with particular attention to their geopolitical implications. The article also highlights the potential for resistance, arguing that the negotiation and contestation of standards can challenge hegemonic norms and foster alternative practices. Ultimately, this work calls for further investigation into the intersection of standards, power, and imperialism to better understand how global hierarchies are reinforced through standardization.

1. Introduction

The artificial world is a world essentially normative (Vega and Lawler 2005). What does it mean? It means that it is an ordered, regular and stable environment, full of infrastructures and objects created and maintained through numerous highly regulated technological practices. Standards are artifacts that generate and sustain this normative world, permeating our everyday lives. Our world is populated with standards (Lawler 2020). These standards – independently of their natures – are embedded in the institutions of our everyday life, subtly reinforcing the interests and priorities of those who establish them. They are shaped by political, technological, social values and disputes. Examples include electric plugs (which provide a standardized connection for powering electrical devices), power distribution boxes (which safely distribute electricity within buildings), clothing sizes (which ensure consistency in garment fit across different brands), the Intel hardware/Windows software alliance (which promotes compatibility between hardware and operating systems), and traffic lights (which regulate vehicle flow to ensure road safety). Additionally, ATMs (which facilitate secure financial transactions), supermarket checkout lines (which streamline customer flow and improve efficiency), recipes (which ensure consistent culinary results), and clothing labels (which provide essential care and sizing information) play crucial roles, to mention only a few.

Mechane, n. 8, 2024 • Mimesis Edizioni, Milano-Udine Web: mimesisjournals.com/ojs/index.php/mechane • ISBN: 9791222320755 • ISSN: 2784-9961 • DOI: 10.7413/ 2784mchn0002

These standards are integral to organizing various aspects of daily life, ensuring compatibility, efficiency, and safety in interactions with technology, products, and services. Beyond physical objects, standards also shape social interactions and cultural norms, such as etiquette standards that foster civility and moral standards that guide ethical decisions.

Despite their pervasive influence, standards often remain invisible to our conscious awareness. Although standards emerge from political decisions and conflicts of interest, once they are assimilated into society, they become part of the framework of the artificial world. We engage with them seamlessly, rarely recognizing their essential role in shaping our experiences. They become intertwined with the fabric of human practices, enveloping our existence in their influence (Salazar *et al.* 2006). This invisibility is due to factors such as habitualization (interactions with standards become routine), design intention (standards are created to be unobtrusive), and social acceptance (standards are embedded in social norms, making them appear natural and thus unquestioned), among others. As a result, our lives – richly populated with objects and technological processes – are inadvertently shaped and normatively structured by these standards (Singer 1996; Schueler *et al.* 2008; Thévenot 2009)[1].

Revealing these invisible standards is crucial for understanding the depth of our interactions with the world we live in. Moreover, recognizing the power of standards allows us to engage critically with the technologies that shape our lives – questioning assumptions, evaluating impacts, and advocating for ethical and responsible use.

At the same time, it is essential to consider how the definition and acceptance of standards are tied to the exercise of real power. Standards, far from being merely technical or functional norms, reflect the interests and values of those who establish and uphold them. Their capacity to shape practices, constrain possibilities, and define what is considered valid and desirable is an expression of structural power. In this way, power is exerted not only through the explicit imposition of rules but also through the subtle consolidation of standards that delineate the realm of the possible.

In this article, I pursue several objectives. First, I propose an expanded perspective on standards, which I call the "functionalist perspective". Second, I argue for treating standards as artifacts, a move that allows for a critical reassessment of the functionalist perspective and for identifying the key dimensions involved in the context of standards. Incorporating a philosophical perspective on artifacts into

1 In this way, standards operate as an implicit architecture that guides our interactions and expectations, subtly dictating the parameters within which we navigate our social and material environments. They not only reflect existing power dynamics but also perpetuate them, reinforcing the status quo while simultaneously obscuring their origins. Thus, the relationship between individuals and standards is not merely one of compliance; it is a dynamic interplay in which our identities and practices are continuously negotiated within the contours established by these often-invisible yet omnipresent forces.

the study of standards offers significant analytical advantages, especially by revealing how standards are deeply intertwined with power in its various forms. Third, I concentrate on the relationship between standards and power, aiming to clarify how standards function as instruments of power while simultaneously manifesting real power relations. I will also examine the geopolitical ramifications of standards and standardization processes. Finally, I will present preliminary conclusions and highlight several philosophically provocative issues for future investigation.

2. The traditional image: the perspective of functionalism

The existing literature (Bowker,Star 1999; Lampland, Star 2009; Timmermans, Epstein 2010; Bingen, Busch 2006; Busch 2012; 2017; de Vrie 2007; 2006; 2012; among others) extensively documents that standards and the processes of standardization can hold varied and even contradictory meanings for different individuals and groups, depending on their perspectives and contexts. Despite this diversity of interpretations, the functionalist characterization of standards has emerged as the dominant and most widely accepted framework in the field.

From this perspective, a standard is conceptualized as an artifact designed to perform a critical societal function: establishing a rule or a set of rules that are collectively and socially "agreed upon"[2] to structure specific activities. These activities can range from the production of goods to the management and regulation of processes, the provision of materials or raw inputs, the delivery of services, or even the governance of product usage.

By providing a shared reference point, standards facilitate coordination, predictability, and accountability across a broad array of social, economic, and technical domains. This function plays a pivotal role in constructing uniformities that transcend spatial and temporal boundaries. Such uniformities are typically anchored in the practices and authority of communities of experts, professional organizations, industrial and business associations, international governmental agencies, or nation-states. This functionalist view underscores the essential role of standards in shaping modern organizational and technological practices.

Within the functionalist framework, standards can be classified into four main types, each exhibiting distinct characteristics and levels of complexity (Timmermans, Berg 2003; de Vries 1998; 2006; 2008):

1. Design Standards. Design standards are foundational to ensuring uniformity and compatibility within both social and technical systems. They specify the properties and characteristics of artifacts, tools, or systems, enabling seamless integration across diverse applications. These standards often emerge from collaboration among industrial stakeholders, technical experts, and regulatory bodies. For in-

2 The quotation marks refer to the disputes that take place until a standard or standardization process becomes stabilized, as will be discussed later.

stance, USB (Universal Serial Bus) standards have become a cornerstone of modern technology, facilitating interoperability between devices such as smartphones, external drives, and peripherals from different manufacturers. Beyond consumer technology, design standards are critical in infrastructure projects, such as ISO 9001 for quality management systems, which ensures that products and services consistently meet customer and regulatory requirements. These standards not only streamline production but also foster innovation by providing a stable framework within which new designs can emerge.

2. Terminological or Basic Standards. Terminological standards focus on creating semantically stable categories that underpin shared understanding, classification, and communication across disciplines and practices. Their value lies in reducing ambiguity and ensuring consistency in knowledge systems. A prominent example is the Diagnostic and Statistical Manual of Mental Disorders (DSM), which standardizes the categorization of mental health conditions. This standard enables practitioners across the globe to diagnose, treat, and research mental health issues with a common lexicon, despite variations in cultural and contextual interpretations. Such standards also shape professional training, influence public policy, and guide pharmaceutical development. Another example can be found in biology, where the Linnaean system of taxonomy provides a structured framework for naming and classifying species, enabling coherent communication among scientists worldwide. Terminological standards, therefore, are not merely descriptive; they actively shape how knowledge is constructed and applied.

3. Measurement Standards. Measurement standards serve to establish benchmarks for performance, quality, and optimal solutions to complex problems. These standards often reflect a balance between technical precision and adaptability to context-specific needs. For example, university grading systems, such as the Grade Point Average (GPA) scale, provide a standardized mechanism for evaluating and comparing academic performance across institutions, while still allowing for variations in pedagogical approaches and assessment methods.[3] In a different domain, the Energy Star certification exemplifies how measurement standards can promote sustainability.[4] By setting efficiency thresholds for energy use in appliances, Energy Star encourages manufacturers to innovate while helping consumers make environmentally conscious choices. Such standards are not static; they evolve to reflect new knowledge, technologies, and societal priorities, illustrating their dynamic and context-sensitive nature.

4. Procedural Standards. Procedural standards are vital for structuring processes, ensuring their reproducibility, and maintaining quality across different contexts. They specify the sequence of steps and the conditions under which these steps

3 The GPA is a standardized measure used in the U.S. educational system to evaluate and compare student academic performance.

4 ENERGY STAR, administered by the U.S. Environmental Protection Agency, certifies energy-efficient products and systems, aiming to reduce greenhouse gas emissions and promote cost-effective energy use (https://www.energystar.gov).

must be performed to achieve desired outcomes. The Toyota Production System (TPS) is a paradigmatic example, renowned for its principles of just-in-time production and continuous improvement. By standardizing workflows, TPS minimizes waste, enhances efficiency, and ensures product quality, while remaining flexible enough to accommodate innovation and customization. Procedural standards extend beyond manufacturing; for instance, in healthcare, surgical protocols ensure patient safety by prescribing step-by-step procedures for preoperative, intraoperative, and postoperative care. These standards exemplify how procedural rules can integrate technical precision with human adaptability, fostering reliability in complex systems.

Although standards are often analyzed through a functionalist lens – as technical tools designed to achieve coordination, uniformity, and predictability – they are, in fact, deeply embedded social constructs, shaped by and reflective of broader societal values, power dynamics, and historical contingencies. The dominant functionalist perspective, while invaluable for understanding the operational roles of standards, tends to obscure key characteristics of their formation and broader implications.

First, standards and standardization are not inevitable outcomes but rather contingent results of protracted negotiation processes that aim to regulate complex sociotechnical practices (Van de Kaa *et al.* 2007). These negotiations, often taking place within the context of modern industrial and post-industrial societies, reintroduce politics into the ostensibly neutral terrain of standardization. Competing interests, institutional power struggles, and ideological commitments significantly influence the creation of standards, embedding them with values and priorities that reflect dominant political and economic agendas rather than universal consensus.

Second, standards incorporate intricate scientific-technical, social, and political content, extending their influence far beyond the confines of technological practices (Schueler *et al.* 2008). While they serve to structure relationships between inputs, artifacts, and users, they simultaneously shape broader patterns of social interaction, labour organization, and resource allocation. For instance, standards governing energy efficiency not only guide the technical design of appliances but also have profound implications for global environmental policies, economic markets, and consumer behaviour.

Finally, standards form a critical yet often underexamined infrastructure that underpins human practices across technical, political, social, economic, and ethical dimensions. By embedding normative assumptions about what constitutes efficiency, quality, or fairness, standards subtly regulate everyday life in ways that are not always transparent or equitable. This broader role invites a rethinking of standards as artifacts of power that mediate relationships not only among people and technologies but also between competing visions of social order and progress.

In this sense, a more expansive approach to the study of standards is required – one that transcends functionalist analyses to illuminate the contingent, contested, and value-laden nature of these foundational elements of our artificial actual world.

3. A philosophical view on artifacts

Artifacts are not mere combinations of structure and function; they possess a historical dimension and are deeply embedded in human practices, allowing them to be identified and re-identified across contexts. As Broncano (2012) observes, "artifacts emerge within specific historical production relations and transform alongside these relations. They act as object-classes that articulate our engagement with the world, simultaneously existing as individual entities and as members of broader categories. Crucially, artifacts continuously reconfigure the space of possibilities, shaping the horizons of action for individuals and communities" (Broncano 2012, p. 76).

These two dimensions – objective reality and the potential for action – remain unified when artifacts are understood as "operators of possibilities". They do more than fulfil instrumental purposes; they enable and organize practices. Writing, for instance, depends on the existence of material artifacts such as paper and pens. These artifacts are not simply tools; they make writing itself possible, shaping its role as a representational medium and reconfiguring modes of thought (ivi, p. 93). Thus, artifacts are operators of possibilities: they constitute and shape practices while influencing the reality from which technical imagination draws inspiration for new designs and plans for action.

Artifacts, as articulators of human practices, are intentional, normative, and meaningful (Lawler 2008). Their intentionality stems from their embedding within a network of causal and informational relationships. Their functions embody this intentionality, referencing the external actions they enable and structure. Informational content, though ideational and relatively independent of materiality, is communicated through artifacts implicitly or explicitly. For example, a bicycle, as an artifact of urban transportation, facilitates mobility while generating specific beliefs about its use, its relationship with other artifacts, and the possibilities it offers.

The relational nature of artifacts is evident in their integration into broader technical systems. Bicycles in urban contexts coexist with bike lanes, signage, repair shops, safety gear, and public policies, forming an interconnected system. These relationships, grounded in intentionality, provide the holistic structure that makes artifacts intelligible within practices of design, production, use, and repair. Absent this structure, artifacts would lose their coherence and capacity to function as meaningful components of human activity.

The meanings of artifacts are shaped by their socio-historical contexts and networks. A bicycle, for example, may signify leisure in one setting and a solution to urban transportation challenges in another. Artifacts also embody symbolic properties, reflecting socio-economic class, cultural identity, and aesthetic preferences. Urban bicycles, with their distinctive materials and designs, serve as markers of belonging to specific urban subcultures. Over time, artifacts acquire a narrative identity, reflecting changes in their use, production conditions, and evolving applications.

Artifacts are also normative, constraining and regulating human actions. An airport scanner, for instance, organizes the security checkpoint as a disciplinary space, orchestrating interactions with other artifacts and inducing behaviours that conform to security protocols. In doing so, it suspends individual intentions in favour of externally imposed guidelines, subordinating autonomy to institutional authority. The normative dimension of artifacts also includes corrective conditions: they can fail due to poor design, misuse, or intentional deviation.

Artifacts, as operators of possibilities, once realized, shape technological practices in the production, reproduction, and signification of our artificial worlds. Their dual nature – both ideational and material – enables them to influence the organization of human activity, forming the building blocks of technological practices.

From this perspective, technological practices can be understood as regimented sets of activities and processes involving the application of scientific and technological knowledge alongside skilled labour to address problems related to the production, reproduction, and use of goods and services. These practices engage multiple dimensions of social life and unfold through highly organized systems of action. Such systems integrate institutions, individuals, artifacts, raw materials, and frameworks of political and moral values, thereby shaping and generating artificial worlds.

Technological practices are not isolated or merely functional endeavours; they are deeply embedded within broader sociocultural and historical contexts. They reflect the interplay between human ingenuity and the constraints of natural and social conditions, producing outcomes that embody both technical efficiency and normative significance. By structuring these practices, artifacts become constitutive elements of the artificial worlds we inhabit.

In the following section, I will apply the philosophical perspective developed here on artifacts as "operators of possibilities" to the case of standards and standardization processes. By examining how standards shape and regiment practices, I aim to illuminate their role as constitutive artifacts within our socio-technical systems, exploring their different dimensions in detail.

4. Standards as artifacts

Standards, as artifacts, operate as "operators of possibilities" – nodes through which the artificial worlds of industrial and post-industrial societies are realized and structured. To treat standards as artifacts is to recognize their role as articulators and constituents of human practices, characterized by six essential features:

(a) Dual Nature. Standards embody both ideational (cognitive) and material (causal) dimensions. Their ideational content includes human purposes and scientific and technical knowledge, which define their functions and ensure their validity and effectiveness. Their material dimensions serve as vehicles for these

purposes, as seen in the FAO's global food production standards, which operationalize extensive scientific knowledge[5].

(b) Holistic Existence. Standards exist within networks of interdependence, shaping practices and transforming agents. Their holistic nature integrates them into broader systems of equivalence, such as educational grading systems or clothing sizes, which appear naturalized despite their contingency.

(c) Intentionality and Meaning. Standards convey ideational content, structuring practices and guiding actions. A standard for renewable energy, for example, does not merely define technical specifications but also embodies a vision of environmental sustainability.

(d) Normativity. Standards regulate practices, guiding behaviours according to the values they encapsulate. For instance, airport security protocols constrain individual autonomy while ensuring collective safety, illustrating the normative power of standardization.

(e) Contingent Emergence. Standards arise from sociotechnical practices and reflect negotiations among diverse stakeholders. They are inherently contingent, shaped by specific historical conditions and power dynamics.

(f) Objectification. Once established, standards acquire an independent reality, presenting themselves as objective features of the world. Their naturalization within practices often obscures their contingent origins, reinforcing their authority.

Standards are constitutive artifacts within technological practices, shaping the artificial worlds in which human activities unfold. Their dual nature – combining material and ideational dimensions – and their normative power enable them to structure not only technical systems but also the broader social and political landscapes they inhabit. By providing uniformity, precision and shared frameworks, standards do not merely complement technological practices; they are fundamental to their organization and evolution.

As operators of possibilities, standards define and constrain actions within sociotechnical systems. They stabilize complex systems by guiding the interactions among artifacts, people, and processes, ensuring coherence and compatibility. More than passive rules, standards embody the values and priorities of the societies that create them, actively constructing the artificial environments that frame contemporary life.

This dual role – regulating and constituting – positions standards as indispensable for modern technological practices. By "giving life" to these practices, they mediate the relationships that underpin production, innovation, and social organization, illustrating their profound influence on both the technical and the societal dimensions of human existence.

5 The Food and Agriculture Organization of the United Nations (FAO) establishes global food production standards to ensure food safety, quality, and sustainability across diverse agricultural and food systems. These standards operationalize extensive scientific and technical knowledge, integrating inputs from various fields such as agricultural science, nutrition, environmental science, and public health. They aim to harmonize practices across countries, facilitating international trade and improving global food security (https://www.fao.org).

5. The role and dynamics of standards as artifacts

The study of standards and standardization offers a distinct perspective for examining the intersection of technical systems, governance, and human practices. Far from being neutral, standards are imbued with intentionality, shaped by socio-economic and political histories, and evolve through negotiations among diverse stakeholders. This section aims to unpack the production, diffusion, and use of standards, highlighting their normative and symbolic dimensions. Building on the previous discussion, it invites us to consider standards as artifacts in the strictest sense: as operators of possibilities that, once adopted and enacted, structure the technological practices of production, reproduction, and signification within the artificial worlds we inhabit.

The Dual Nature of Standards. As artifacts, standards possess a dual nature, combining ideational (cognitive) content with material structures. The ideational dimension reflects human purposes and scientific-technological knowledge, defining the standard's function and ensuring its precision, validity, and effectiveness. The material aspect serves as the vehicle for this knowledge, enabling practical application. For instance, the FAO's standards for food production and consumption draw upon extensive scientific expertise to regulate practices globally, ensuring consistency and safety across diverse contexts.

Evolution with Scientific and Technological Advancements. Standards evolve in response to scientific breakthroughs and technological innovations, necessitating the creation of new frameworks to regulate emerging artifacts and practices. Consider genetically modified seeds: their unique properties required entirely new standards to oversee production, commercialization, and consumption. These standards aim to manage risks, ensure compliance, and address ethical concerns, exemplifying the dynamic interplay between technological progress and regulatory frameworks.

Holistic Nature and Socio-Technical Networks. Standards are integral to socio-technical networks, promoting interconnected sets of norms that jointly regulate artifacts, practices, and societal structures. Their holistic nature renders them public and open, enabling refinement and adaptation. However, widespread dissemination often creates inertia, as altering well-established standards demands substantial effort. Units of measurement, such as the metric system, illustrate this dual dynamic of adaptability and resistance to change.

Conditions of Production, Dissemination, and Use. The creation of standards is a contingent process shaped by conflicts of interest and negotiations among diverse actors – scientific communities, industrial sectors, governmental organizations, and civil society. Standards initially exhibit "interpretive flexibility" (Bijker 1995), accommodating competing interests until they stabilize into "black boxes", becoming taken-for-granted frameworks. Dissemination involves further negotiation, as standards are adapted to local contexts while maintaining universal aspirations. Revisions typically occur only when scientific advancements or technological innovations challenge their foundational assumptions.

Universality through Particulars. Standards achieve universality by organizing diverse particulars into coherent systems. While they aspire to regulate universally, their application invariably involves negotiation and contextual adaptation (O'Connell 1993). For example, standardized apple diameters include specific tolerances to account for practical variations, balancing uniformity with flexibility to meet local needs.

Normativity and Regulation. The normative dimension of standards is central to their role in structuring sociotechnical systems (Latour 2008; Egyedi 2000). They guide decision-making in production and reproduction processes, ensuring reliability and consistency over time. This normative power extends beyond technical functionality, shaping behaviours and interactions within organized practices.

Standards and the Distribution of Power. Standards are not neutral instruments; they embody and distribute power in multiple dimensions. They carry ontological authority by defining categories (e.g., what constitutes a "grade A" apple or a unit of grain). They exercise epistemic power by reconstructing nature to align with prevailing standards, praxiological power by dictating production processes, and economic power by disciplining suppliers and structuring markets. Politically, standards facilitate the commodification of goods, the normalization of data collection, and the administrative governance of resources (Thompson 2012). Symbolically, they associate quality with compliance and national identity, creating reputational hierarchies. Socially, they enable complex networks of exchange, fostering equivalences that render markets functional and minimize direct human interaction (Busch 2012; Busch y White 2012).

In summary, standards, as artifacts, are operators of possibilities that construct and regiment the artificial worlds we inhabit. They shape technological practices and societal structures alike, embodying the interplay of intentionality, materiality, and normative authority. By examining their origins, dissemination, and application, we uncover the deeply contingent and contested processes through which they emerge and become embedded in the fabric of modern life.

6. Standards and power

Standards and standardization exert power in various ways, often in subtle and multifaceted manners. As artifacts, they are imbued with authority, often obscuring their origins and concealing their role as sources of power. Standards build a framework of scientific and technical rules and norms that demand obedience, exerting a form of governance over both human and non-human actors, and shaping the actions of the components within sociotechnical systems. At the same time, the processes of standardization presuppose political and social authorities that asymmetrically distribute resources, power, and recognition.

This power can manifest in several distinct forms: *(a) ontological*, when they define the very nature of what constitutes a bulk-produced apple for consumption or a grain of soy; *(b) epistemic*, when they reshape our understanding of nature to

align with the prevailing standards of a specific time and place; *(c) praxiological*, when they prescribe the methods and processes of production; *(d) economic*, when they discipline suppliers by excluding those who fail to meet standards, thereby pushing them out of markets or relegating them to lower tiers within industry hierarchies; *(e) political*, when they facilitate the creation of capitalist markets by transforming singular products into commodities or standardizing data collection through national and international statistical systems, which support the political administration of resources; *(f) symbolic*, when they link the quality of a product or service to compliance with a standard and national identity, thereby generating reputation and prestige; and *(g) social*, when they form complex socio-technical networks that enable the circulation of people, objects, and processes, based on agreed-upon systems of equivalence, or when they establish markets where uniform pricing eliminates the need for direct human interaction (Busch 2012).

Far from being neutral, standards are politically significant. They are codified expressions of particular values, ideologies, and power dynamics, often serving as instruments through which dominant actors – whether states, corporations, or international organizations – assert control over global systems. The creation and imposition of standards influence not only economic and technical outcomes but also broader social and political landscapes. Standards define what is considered legitimate knowledge, acceptable practices, and even desirable futures, thus acting as tools of governance that operate through seemingly apolitical channels.

Take, for example, the technical standards that govern global trade, such as those set by the World Trade Organization (WTO) or the International Organization for Standardization (ISO). These standards are rarely neutral. They reflect the production methods, regulatory environments, and technological infrastructures of advanced economies, which developing countries are often compelled to adopt in order to access international markets. In doing so, these standards implicitly carry the political and economic assumptions of the global North, embedding a set of values – such as efficiency, productivity, and sustainability – defined on terms that frequently marginalize alternative development models or forms of resource use.

The political power of standards becomes even more evident when we consider how they naturalize and institutionalize certain power relations. By codifying particular norms, standards create a global order in which peripheral nations must comply with rules they did not set, under conditions they cannot fully control. This dynamic has significant consequences for developing countries, where compliance often demands substantial resource allocation – whether in terms of technology, expertise, or infrastructure – frequently beyond their immediate capacity. The result is a structural dependency in which compliance is necessary for participation in global markets, yet it simultaneously perpetuates subordination by restricting the ability of these nations to pursue alternative developmental paths.

Standards operate through what could be termed "normative hegemony" – the capacity to set the "rules of the game" that others must follow, often without questioning the underlying values embedded in those rules. Standards function as mechanisms of *soft imperialism*, diffusing a particular worldview through mate-

rial and regulatory infrastructures. By compelling developing nations to adhere to externally imposed rules, standards erode local governance capacities, diminishing the agency of these nations to regulate their economies and technologies according to local priorities. This imposition of external norms undermines the possibility of alternative political and economic systems that may better serve the needs and aspirations of these societies. For example, environmental or labour standards designed by industrialized countries reflect their own historical and material conditions, but in developing contexts, these standards can exacerbate poverty or hinder economic growth.

Ultimately, the political nature of standards is inseparable from the broader power structures of globalization. They act as vectors through which the global North maintains its dominance, ensuring that peripheral nations remain aligned with an international system that primarily benefits the centre. The very process of setting standards is exclusionary, often involving technocratic bodies that operate far from democratic oversight, denying participation from those most affected by their decisions. For developing nations, this exclusion reinforces a hierarchy of knowledge and expertise, where only certain forms of rationality – those of the powerful – are enshrined in standards, further marginalizing local knowledge and alternative political possibilities.

A particularly illustrative example of this dynamic is the case of agricultural standards imposed by the European Union (EU) through its *Sanitary and Phytosanitary (SPS) Measures* – rules governing food safety, plant health, and animal welfare. The EU, as a global regulatory superpower, imposes stringent requirements on imported agricultural products, demanding compliance with high standards for pesticide residues, food additives, and hygiene practices. These standards are rooted in the EU's specific health and environmental priorities, reflecting the preferences of its relatively affluent population and highly developed regulatory apparatus. However, for many developing countries, particularly in Africa and Latin America, meeting these standards poses a formidable challenge.

The political nature of the SPS standards is clear: they are not merely technical guidelines for ensuring food safety; they are instruments of economic governance that enforce compliance with practices and technologies that align with European priorities. This reveals a deeper form of dependency: compliance with these standards is not only about meeting technical criteria, but also about restructuring agricultural practices and governance systems to conform to a global economic order that benefits the rule-makers. The global South often finds itself positioned as a passive receiver of these standards, rather than an active participant in their creation. This lack of participation perpetuates a form of epistemic injustice, where the ability to influence global norms is reserved for those with the economic and institutional power to do so.

The political character of standards lies in their ability to regulate not just markets but entire societies by imposing certain norms, practices, and values. Standards are far from neutral; they are expressions of power that reflect the interests of those who set them. When dominant countries or institutions define global standards,

they encode their economic priorities, cultural values, and technological frameworks into the rules everyone must follow. For developing countries, particularly in Latin America, this means aligning with foreign norms that often overlook local realities, needs, and aspirations. The result is not only economic dependency but a deeper political dependency, as these nations are compelled to shape their policies and practices according to the priorities of external, often distant, centers of power.

The case of genetically modified (GM) soybeans offers another example of how standards reshape national development trajectories. Multinational corporations like Monsanto played a pivotal role in defining the global standard for GM crops, pushing for the adoption of their genetically modified seeds worldwide. Argentina, seeking to boost agricultural exports, adopted GM soybeans in the late 1990s, aligning its agricultural practices with the standards set by powerful biotech companies and the global North (Filomeno, 2013).

While this shift initially spurred economic growth, the political ramifications became evident over time. By adopting Monsanto's standards, Argentina ceded control over its agricultural sovereignty. The widespread use of a single, patented seed meant that Argentine farmers were required to pay royalties to Monsanto, undermining their autonomy. Additionally, the spread of GM soybeans contributed to environmental and social issues, such as increased deforestation, pesticide use, and displacement of small-scale farmers. These consequences were shaped by a standard that prioritized industrial agriculture over sustainable local practices.

Politically, this case illustrates how standards can not only dictate technical compliance but also reshape governance structures, compelling countries to conform to external priorities rather than focusing on locally driven policies. Argentina's adoption of GM soybeans resulted in a national policy framework centred on meeting global market demands, rather than fostering food security, rural development, or environmental sustainability.

Standards are central to global inequality and dependency. They are not neutral technical instruments but are deeply embedded in political content and power relations. The creation and enforcement of standards reflect the values and interests of dominant nations or institutions, shaping the global economic and technological order in ways that primarily benefit those who set the rules. For developing countries, these standards impose significant challenges, compelling them to adopt norms that do not align with their material conditions or cultural contexts, thus reinforcing dependency and limiting autonomy in policymaking. This dynamic perpetuates global inequalities, as developing nations are forced to expend resources to comply with standards set by others, often without meaningful participation in their formulation. As a result, their economic growth and sovereignty are constrained, further marginalizing them in the global system.

In the context of Latin America, these standards impact several key dimensions – economic, political, and cultural – reinforcing marginalization and limiting opportunities for self-determined development. Strengthening Latin America's participation in international standard-setting bodies, as well as enhancing its internal capacity to engage with these processes, is crucial for addressing the structural

inequalities perpetuated by the current system. By doing so, Latin American nations can reduce dependency, improve local policy autonomy, and contribute to a more just and equitable global system.

7. Concluding reflections: paving the way for future research

Standards are not merely technical artifacts; they are fundamental components of the artificial worlds we inhabit, shaping the ontological, epistemological, normative, and axiological dimensions of human life. As artifacts that govern the very conditions of existence, standards influence our interactions, determine what is permissible, and subtly distribute power within complex sociotechnical networks. Far from being neutral or merely functional, standards are intrinsically political, serving as tools of invisible governance that reflect and perpetuate the interests of dominant actors. Their pervasive influence extends across technological, political, social, and ethical domains, moulding not only the material world but also the values that underpin human practices.

As previously discussed, standards function as potent mechanisms of normalization, structuring global systems and organizing both individual and collective life. They regulate practices, solidify power alliances, and promote specific interests, often privileging the values and priorities of those who establish them. This dynamic is particularly evident in global power relations, where standardization processes often operate as instruments of governance and domination. The examples explored – ranging from product standards in global trade to the dominance of Western technologies – illustrate how standards marginalize peripheral nations and consolidate the geopolitical influence of central powers.

The relationship between standards and imperialism, though briefly touched upon here, merits deeper exploration. Standards play a crucial role in extending the reach of imperial powers, both historically and in the context of contemporary global systems. By imposing uniform norms across vast and diverse territories, they facilitate control and systematically exclude alternative practices, often at the expense of local autonomy and cultural diversity[6]. This phenomenon is particularly pronounced in the realms of technology and global trade, where dominant

6 Historically, empires have used standards – whether in language, measurement, or governance – as tools to unify and control diverse populations. The British Empire, for example, imposed English as the administrative language and British common law as the legal framework, facilitating governance while marginalizing local traditions. Similarly, the French adoption of the metric system standardized trade and governance across Europe, symbolizing French dominance. In the modern era, the United States plays a comparable role through its dominance in technological and financial standards. The U.S. dollar serves as the global reserve currency, and American tech companies define protocols and standards in digital communication and commerce. These practices extend U.S. influence globally, compelling other nations to align with norms they did not help establish.

countries and corporations set the rules that shape global markets and governance structures. A more thorough investigation of this dynamic is essential for understanding the contemporary geopolitical implications of standards and their role in reinforcing global power hierarchies. Moreover, such an exploration would contribute to the analysis of political activism and the restoration of agency with the aim of dismantling power asymmetries.

However, standards are not immutable. While they often reinforce hegemonic power structures, they also leave room for agency and resistance. The processes of standardization involve interpretative flexibility and negotiation, offering marginalized actors, peripheral states, and civil society the opportunity to challenge dominant norms. These actors can resist compliance by advocating for alternative standards or by contesting the underlying assumptions that inform prevailing ones. Thus, despite the pervasiveness of standards, they remain a site of contestation, and understanding this dynamic is critical for recognizing the potential for resistance in an increasingly standardized global order.

Thus, while standards often remain invisible in our daily experiences, they are critical instruments of power that structure not only our material environment but also the socio-political realities in which we exist. By acknowledging their foundational role in shaping power dynamics, we can gain a clearer understanding of how these artifacts influence our lives and engage more critically with the technologies and norms that govern our world. Further investigation into the intersection of standards and imperialism will provide essential insights into how global power is constructed and maintained through seemingly mundane yet profoundly consequential artifacts. This ongoing research will also illuminate avenues for political resistance and the potential for reducing power imbalances within an increasingly standardized global order.

References

Bijker, W.E.
1995 *Of Bicycles, Bakelites, and Bulbs: Toward a Theory of Sociotechnical Change*, MIT Press, Cambridge(MA).

Bingen, J.; Busch, L. (eds.)
2006 *Agricultural Standards: The Shape of the Global Food and Fiber System*, Springer, Dordrecht.

Bowker, G., Star, S.
1999 *Sorting Things Out. Classification and Its Consequences*, The MIT Press, Cambridge (MA)..

Broncano, F.
2012 *La estrategia del simbionte. Cultura material para nuevas humanidades*,, Editorial Delirio, Salamanca.

Busch, L.
2012 *Standards: Recipes for Reality*, The MIT Press, Cambridge (MA).
2017 *Standards and Their Problems: From Technical Specifications to World-Making. In Transforming the Rural*. Published online: 03 Jul 2017.

Busch, L., White, K.P.
2012 *On the Peculiarity of Standards: A Reply to Thompson*, in "Philososophy & Technology", 23 (2), Springer nature, Berlin, pp. 243-248.

De Langhe, R., Greiff, M.
2009 *Standards and the D*istribution of Cognitive Labour, in "Logic Journal of IGPL", 18(2), pp. *278-293.*

De Vries, H.J.
1998 The Classification of Standards, in "Knowledge Organiz*ation", 25(3), pp. 79-89.*
2006 *Best Prac*tice in Company Standardization, in "International Journal of IT Standards and Standardization Res*earch", 4 (1), pp. 62-85.*
2007 *Fundamentals o*f Standards and Standardization, in W. Hesser, A. *Feilzer, H.J. De Vries (eds.), Standardi*sation in Companies and Markets, Helmut Schmidt Univer*sity, Hamburg, pp. 1-34.*
2008 *Standardization:* A Business Science Perspective, in J. Schueler, *A. Fickers, A. Hommels (eds.), Barg*aining Norms, Arguing Standards, STT Netherland Study Centre for Technology, The Hague (*Netherlands), pp. 19-32.*
2012 *Standardization – A Multi*disciplinary Field of Research, in "Journal of Standards and Standardization",10(2*), pp. 29-38.*

Egeyedi, T.
2000 *The Standardised Container: Gateway Technologies in Cargo Transport*, in "Homo Oeconomicus", Institute of SocioEconomics, vol. 17, pp. 231-262.

Filomeno, F.A.
2013 *How Argentine farmers overpowered Monsanto: The mobilization of knowledge-users and intellectual property regimes*, in "Journal of Politics in Latin America", 5(3), pp. 35-71.

Lampland, M., Star, S. (eds)
2009 *Standards and Their Stories: How Quantifying, Classifying, and Formalizing Practices Shape Everyday* Life, Cornell University Press, Ithaca (NY).

Latour, B.
2008 *Reensamblar lo social: una introducción a la teoría del acto*r-red, Manantial, Buenos Aires.

Lawler, D.
2008 *Una incursión ontológica al mundo de los productos de la acción té*cnica, in "ArtefaCToS: Revista de Estudios sobre la Ciencia y la Tecnología", 1(1), pp. 4-17.
2020 *Los estándares como artef*actos*, in"Filosofia Unisinos Journal of Philo*sophy", 21(1), pp. 24-35.

O'Connell, J.
1993 *The Creation of Universality by the Circulation of Particulars*, in "Social Studies of Science", 23(1), pp. 120-173.

Salazar, M. Miller, J., Busch, L., Mascarenhas, M.
2006 *The Indivisibility of Science, Policy and Ethics: Starlink and the Making of Standards*, in J. Bingen; L. Busch (eds.), *Agricultural Standards: The Shape of the Global Food and Fiber System*, Springer, Dordrecht, pp. 111-124.

Schueler, J., Fickers, A., Hommels, A.
2008 *Bargaining Norms: Arguing Standards*, STT Netherland Study Centre for Technology, The Hague (Netherland).

Singer, B.
1996 *Towards a Sociology of Standards: Problems of a Criterial Society*, in "The Canadian Journal of Sociology", 21(2), pp. 203-221.

Sumner, J., Gooday, G.
2008 *Introduction: Does Standardization Make Things Standard?*, in I. Inkster (ed.), *By Whose Standards? Standardization, Stability and Uniformity in the History of Information and Electrical Technologies*, in "History of Technology", 28, pp. 3-35.

Thévenot, L.
2009 *Governing Life by Standards: A View from Engagements*, in "Social Studies of Science", 39(5), pp. 793-813.

Thompson, P.
2012 *There's an App for That: Technical Standards and Commodification by Technological Means*, in "Philososophy & Technology", 25, pp. 87-103.

Timmersmans, S., Berg, M.
2003 *The Gold Standard: The Challenge of Evidence-Based Medicine and Standardization in Health Care*, Temple University Press, Philadelphia (PA).

Timmermans, S., Epstein, S.
2010 *A World of Standards but not a Standard World: Toward a Sociology of Standards and Standardization*, in "Annual Review of Sociology", 36, pp. 69-89.

Van De Kaa, G., De Vries, H., Van Heck, H., Van Den Ende, J.
2007 *The Emergence of Standards: A Meta-analysis*, in *HICSS '07: Proceedings of the 40th Hawaii International Conference on System Sciences*, IEEE Computer Society, Washington.

Vega, J., Lawler, D.
2005 *La experiencia del mundo técnico*, in "Revista Iberoamericana de Ciencia, Tecnología y Sociedad – CTS", 2(5), pp. 67-79.