Introduction

The Brazilian port system has demonstrated its robustness, surpassing its total cargo throughput year after year, and achieving an unprecedented mark of 1.321 billion tons in 2024, which represents 97% of the total volume of Brazil's foreign trade operations. In the containerized cargo market, the system handled 13.9 million TEUs (Twenty-Foot Equivalent Units), reflecting a growth of 19.6% compared to 2023. Even during the COVID-19 pandemic period (2020-2022), Brazilian ports and terminals experienced an average total growth of 3.9%, indicating their resilience to the effects of crises and economic fluctuations [1].

These figures are evidence of a robust and rapidly growing port system, currently comprising thirty-five public ports, 20 Public Port Authorities, one private Port Authority, 138 active leasing contracts in public ports, and 235 authorized facilities of several types, of which 167 are private cargo terminals [2].

Port authorities are federal public companies (Dock Companies) or state-owned enterprises managing public ports through delegation agreements with the Federal Government. It is also important to highlight that all public ports are considered public assets of the Union that provide public service, with legal obligations that require, among other responsibilities, the authorization of cargo handling from/to vessels; the collection of amounts from public tariffs related to their activities; and the regular, efficient, safe, and environmentally respectful oversight of port operations.

Historically, these public companies were initially established to manage and operate the ports with their own personnel, as Dock Companies or public enterprises are dependent on and supervised by state government agencies. Between 1975 and 1993, the administration, operation, and oversight of public ports were centralized in the "Empresa de Portos do Brasil S.A. – PORTOBRAS", which was linked to the Ministry of Transport at that time. During this period, port authorities and the now-defunct Dredging Brazilian Company – CBD became subsidiaries affiliated with the holding company PORTOBRAS.

In 1975, the development of the first Port Master Plan, known as PDP in Portuguese, was

initiated, and it was the responsibility of PORTOBRAS to continue this work and carry out subsequent updates. According to Pilloni and Silva, these PDPs "*were unified planning documents, encompassing everything from the analysis of the demand for goods to be directed to the port to the forecast of area reservations in accordance with its expansion plan*" (Pilloni and Silva, 2013). It was undoubtedly a type of innovation concerning the planning of public ports at the time.

Starting in 1993, with the change in the model for port exploitation in the country and the dissolution of PORTOBRAS after only 18 years of existence, Dock Companies and state administrations assumed the role of port authorities, leaving the operation function to the private sector through leasing contracts preceded by public bidding. This marked the beginning of the Landlord Port model in Brazil. Besides, private terminals outside public ports would be subject to prior authorization from the Federal Government.

During this period, the focus of the Port Authorities was entirely on the construction, expansion, improvement, maintenance, and operation of the public ports they managed, as required by the legislation and public policy guidelines of the time. It is worth noting that in 1993, Brazil had not yet opened its market to international trade, which began to materialize from the second half of the 1990s onward, particularly with the establishment of the World Trade Organization (WTO) and GATT 1994 Agreement.

Competition and competitiveness were not terms that resonated with port managers at that time, who were more concerned with the day-to-day operations of the ports without the external pressure of demand and fierce commercial competition, as observed nowadays. The national market was closed, and the system was predominantly operated by public companies and its public employees, with private terminals restricted to operating mainly with their own cargo, in a vertical integration enforced by model and regulation.

At the end of 2012, a new amendment to the legal framework occurred, which was consolidated in 2013 in the form of Law 12815, governing the port system and the operation of ports to the present day. Several legal and regulatory innovations arose from this new law, particularly the positive supply shock of port services, as public ports and authorized terminals began to openly compete for the same cargo without restrictions or market reservations. Another innovation was the mention of the need for sectoral planning in accordance with integrated logistics policies and guidelines. This was the first time the term "*planning*" appeared in the Brazilian port legal framework.

It is within this brief historical context that this article addresses the theme of innovation and the importance of "Innovation – Innovation Culture" binary within Brazilian Port Authorities.

Themes that Challenge Port Authorities and Call for Innovative Approaches

As observed, Brazilian port authorities, whether for historical reasons or legal guidelines, focus on typical port management activities, leaving the private sector to manage terminals and conduct operations through leasing contracts. The primary factor driving this dynamic can be summarized as the "*demand x port capacity*" dichotomy, through which managers seek to plan, invest in infrastructure and services, and strive to be capable of accommodating the gradual growth for more adequate port services, efficiently, at competitive costs and prices, and in an environmentally sustainable manner.

Within this constant tension to provide greater productivity and capacity efficiently, other challenges coexist and demand attention and considerable resource allocation from port authorities, such as internal administrative issues; contractual matters with private operators; labor, regulatory, and environmental concerns. This represents the typical day-to-day of public port management, which, in itself, would almost "naturally" induce the perception and necessity for investments and the ongoing realization of various innovation projects. However, as will be explained, there is nothing natural or linear about this induction towards innovation.

In addition to these daily challenges, other issues have recently pressured port authorities to reassess their internal planning and communication strategies while pushing for the development of new managerial and investment capabilities. Notably, issues involving the port-city relationship and the effects of climate change have come to the forefront with the increasing frequency of extreme events in Brazil.

Regarding the port-city relationship, public ports, such as those in Santos, Rio de Janeiro, Paranaguá, Rio Grande, Salvador, Ilhéus, Recife, Fortaleza, Cabedelo, Belém, and Manaus, emerged alongside colonial settlement, land grants, and later towns and cities, in a reciprocal movement of territorial occupation, urban expansion, and, on the port side, military protection, shipment of goods to the Crown, and, after 1808, with the opening of ports to friendly nations, increased trade and maritime traffic [3]. More recently, the

complexity of supply chains and logistics for all types of cargo has challenged the coexistence of ports with the cities in which they are located.

Currently, such coexistence demands greater capacity for dialogue and innovation from both sides to build feasible solutions for better managing and accommodating the tensions between urban mobility and cargo transport; between port expansion and urban development, housing, and cultural heritage; public security and organized crime organizations, among other aspects. In their study of the relationship between ports and port cities, Monié and Vidal (2006) emphasized the need for a *"possible acceptance of a cooperation paradigm"* to define a new port culture that can understand and coexist with the needs and constraints of cities. Regarding this issue, Rocha (2019) addresses the tension between Federal Government, as the superior decision-making body, and the Municipal/City Governments of Port Cities, highlighting the need for high-level and improved dialogue between the parties and the importance of considering Municipal Master Plans. Thus, by definition, it is a constant agenda that becomes more complex as cities and ports seek their expansions.

Regarding the effects of climate change, numerous studies have been conducted in recent years to demonstrate the risks and impacts that climate changes have had and will continue to have in the near future on port infrastructure and operations, challenging the current understanding of these issues. According to the World Meteorological Organization (WMO), 2024 was the hottest year on record, with a variation of 1.55°C (34.79°F) above pre-industrial levels, advancing the goal of the Paris Agreement scenario for limiting global temperature increase to 1.5°C (34.7°F) by 2030 by six years [4]. In the same year, Brazil experienced 10 extreme climate events, three of which were classified as unprecedented: the floods in State of Rio Grande do Sul (South Brazil), the drought in the Amazon Region (North Brazil), and the heatwave in the central region of the country in August [5]. In the case of Rio Grande do Sul, the public port of Porto Alegre located in the capital was completely flooded, halting operations for several weeks.

In this regard, it is important to mention the fundamental work carried out by the National Waterway Transport Agency on the subject, in partnership with the Ministries of Science, Technology and Innovation; Environment and Climate Change; and Ports and Airports (ANTAQ, 2021). In these studies, the Agency analyzed and quantified the risks of extreme events on twenty-one public ports in the country and developed a guide for conducting climate risk assessments and adaptation measures for port infrastructures (ANTAQ, 2022).

Considering that investments in port infrastructure have a long maturation period, from planning to the actual execution of projects and commissioning, it is urgent that port authorities, in partnership and coordination with the federal government, various state agencies, and the private sector, adopt a set of initiatives that allow, on a case-by-case basis, the establishment of an investment program to address such events, particularly concerning adaptation measures.

These themes compel port authorities to engage in discussions and reflections on how to make public ports more integrated with cities and society while also being resilient to the effects of climate change. Regardless of the workable solutions, it is certain that innovation, as a structured process to modify a reality and propose the "new," is an integral part of this debate and reflection. But ultimately, what kind of innovation is being referred to?

Back to Basics: Defining Innovation

It is common to approach the topic of innovation, including in the specific case of port authorities, through the pioneering work of J. Schumpeter, who explained the process of *"industrial mutation"* and *"creative destruction"*, brilliantly concluding that the act of innovating within an industrial organization is essential for its comparative advantage in terms of better cost and quality, going beyond competition based on product price (Schumpeter, 2022). Today, this logic, which was once innovative in its proposition, has been appropriated by common sense and remains as relevant as necessary, as innovation has become a paradigm for value creation strategy in any organization, whether private or public, across all sectors of the economy.

In 1995, Nonaka and Takeuchi demonstrated through numerous examples from the Japanese industry how private corporate knowledge leads to continuous innovation, which in turn induces competitive advantages. In other words, knowledge should be viewed as a strategic asset of the firm in the pursuit of competitiveness, and the dynamics of innovation is the main driver of this knowledge generation (Nonaka and Takeuchi, 1995).

Going beyond the Schumpeterian model, it is now well established that other institutions, in addition to the entrepreneur and industrial firm itself, contribute to the collective innovation process. Reflecting on the effect of applying the concept of *"creative destruction"* in the public sector, P. Cavalcante and M. Camões articulate that it *"...can be relativized for new*

practices and emphases in public policies, both to provide innovative public services and to structure and catalyze the capacity of the private initiative and society to provide innovations in their various forms" (Cavalcante and Camões, 2017).

R. Sbragia, E. Stal *et al.* remind of how the *Triple Helix model* was developed from the famous Sábato Triangle, which, as early as the 1960s, highlighted the necessary coordination among Government, Enterprises, and Universities for the emergence and sustainability of National Innovation Systems (NIS). The Triple Helix adds to the Sábato Triangle the successive spirals composed of the reciprocal interrelations among agents at distinct stages of the knowledge generation process, creating creative flows with shared risks, resources, and responsibilities (Sbragia, Stal et al., 2006). These concepts and their implications for public policies and organizations are discussed in detail in the well-known Oslo Manual (OECD, 2018), which focuses on the collection and use of data in the innovation process and activities within the industry.

Mariana Mazzucato has convincingly and evidentially highlighted the decisive and entrepreneurial role of the State, as Public Administration, regarding innovation incubators and entrepreneurship—drawing from the example of companies in Silicon Valley, California—to demonstrate that the State can "*not only facilitate the knowledge economy but effectively create it with bold vision and specific investment*" (Mazzucato, 2014). This "rescue" of the State's role is an important counterpoint to the fallacy of its intrinsic inefficiency and the lack of incentives for the innovative capacity of Public Administration.

To reinforce this point, it is worth quoting a passage from the "*Declaration on Innovation in the Public Sector*" of 2019, by the Organization for Economic Cooperation and Development (OECD), in which the entity recognized that (OECD, 2019):
"[…]
7. Public sector organizations must, therefore, be capable of innovating in a coherent and reliable manner, such that an innovative response to any challenge (current or future) requiring a novel approach can be implemented when and where necessary;
8. To innovate consistently and reliably, public sector organizations need to adopt a deliberate approach to innovation management that is based on previous efforts. An example of this approach is portfolio management, which involves investing in fostering, and leveraging a range of innovative activities in order to offset the risks that some innovative responses may not work or may not be suitable;
[…]"

These excerpts highlight terms such as "*…in a coherent and reliable manner*"; "*adopt a deliberate approach to innovation management*"; "*portfolio management that involves investing in, fostering, and leveraging a range of innovative activities*"; etc. The question then becomes *how* such statements are structured in the practice of Public Institutions and, more importantly, *how* a set of knowledge, skills, and competencies are consolidated in the form of a true Organizational Culture, particularly within a Port Authority of interest.

Isidro-Filho (2018) studied 286 cases of innovation in the Brazilian public sector presented in the Innovation Competitions held annually by the National School of Public Administration in Brasília (ENAP) between 1999 and 2014, identifying the objectives, barriers, and facilitators of innovation (Table 1).

Table 1 – Objectives, barriers, and facilitators to innovation in the Brazilian public sector (adapted from Isidro-Filho, 2018).

Innovation Element	Definition	Types	Percentage
Objectives	The ultimate value of the innovation process, its very reason.	Improvement of work processes.	17,5%
		Information Technology Management.	15,7%
		Citizen Service.	15,7%
		Strategic Planning and Management.	13,6%
		Institutional arrangements for public policies.	13,3%
		Others (<13,3%)	24,2%
Barriers	Variables with a negative influence on innovation efforts.	Bureaucracy, lack of process standardization, method limitations, discontinuity, etc.	19,6%
		Lack of financial resources, lack of budget forecasting, resource contingencies.	11,9%
		Delays in responding to demands, lack of deadline planning, lack of commitment to deadlines, etc.	5,2%
		Others not mentioned (<5,2%)	63,3%
Facilitadores	Variables with a positive influence on innovation efforts (identified simultaneously in several of the analyzed projects).	Availability of resources.	52,1%
		Work Team	52,4%
		Legitimization and commitment of top management.	43,7%
		Development of people and competencies.	32,2%
		Institutional communication.	22,4%
		Standardization of data and processes.	16,8%

It is interesting to note the diversity of innovation project objectives that are typical of the public sector and focused on public policies as well as the improvement of performance and efficiency within organizations. In other words, this is not about disruptive Research, Development, and Innovation (R&D&I) aimed at meeting market demands (which, in the case of the public sector, refers to society in general or specific sectors targeted by public

policy). On the contrary, the data obtained by Isidro-Filho leads to the conclusion that these initiatives are incremental, simple yet creative, and add significant value to the public services provided. This means there is, or should be, an intrinsic public value associated with innovation initiatives [6].

By analogy, it can be anticipated that Brazilian port authorities, as public enterprises, may also leverage this type of study and statistics to similarly identify how to enhance and add more public value and, consequently, competitive capability to their corporate activities, as well as solutions for complex problems such as the port-city relationship and the effects of climate change, in addition to the usual daily challenges they face in interaction with other public entities, the private sector, and academia, thereby replicating a tailored Triple Helix model directed towards the port sector.

It is important to highlight that since 2004, Brazil has had a legal framework addressing incentives for innovation and scientific and technological research within the productive environment, specifically Law 10973, enacted on December 2, 2004 (BRAZIL, 2004). At the same time, the national port sector has never had, and still does not possess, a specific and permanent legal framework or public policy specifically directed towards R&D&I or simply "*innovation*", in the sense of Law 10973 of 2004.

In fact, the current Law 12815 of 2013 (BRAZIL, 2013), which serves as a legal framework for the port sector, as previously mentioned, does not even include the terms "*innovation*", "*innovative*", "*to innovate*", "*R&D&I*", "*research and development*", "*technology*", or "*scientific, technical, and technological development*", despite these subjects having been established in the legal framework and within the Brazilian Federal Public Administration since the 1950s, with a History that dates back to the early 20th century [7].

To avoid creating a new concept, this article adopts the definition of innovation as provided by the Brazilian Innovation Legislation, Law 10973 of 2004, quoted:

"Innovation: the introduction of novelty or improvement in the productive and social environment that results in new products, services, or processes, or encompasses the addition of new functionalities or characteristics to an existing product, service, or process that can lead to enhancements and an actual gain in quality or performance".

This definition serves as a preliminary or initial guideline, combined with the notion of public value, to identify how port authorities could appropriate it and transform it into a

permanent strategy for the public enterprise.

The introduction of "novelty" or "improvement" in the productive environment (the public port itself) and the social environment (for example, the port-city relationship) already signals the possibilities between more radical innovation, which breaks away from the existing state (even in the sense of Schumpeter's creative destruction), and incremental innovation, which is gradual and involves lower risks and costs.

However, how can one transition from a theoretical definition of innovation to an actual culture oriented towards consistent and continuous innovative action?

After All, is There an Innovation Culture in Brazilian Public Ports and Port Authorities?

The term *"Innovation Culture"* here refers to all aspects present within a company or organization that are directed towards understanding and perception, social customs, habits, language, practices, appropriation, development, maintenance, promotion, and perpetuation of typical innovation activities. This involves investments, negotiation, training, infrastructure for R&D&I, cooperation, and innovative local arrangements with Port Authorities as pivots, functioning as socioeconomic organizations that provide specialized public services to all sectors of the national economy and generate and mobilize public resources and assets.

The culture of innovation can manifest both at an individual level (specific Port Authority or port and its local community, within its context, history, and practices) and at a collective level (cooperations and partnerships between ports and distinct communities, including those involving port authorities and international institutions).

What has flourished in the public ports of the Country over the years are isolated initiatives that lack a prior strategy or organizational framework defining guidelines or long-term objectives and goals. Simply put, it is not enough to order that *"innovation must be pursued"*; there should be provisions for means and time for maturation.

Nowadays, perhaps the main initiative of the public ports in the Country aimed at the development and consolidation of the innovation culture is the well-known *"Inova Portos"*, an annual event that involves Authorities, port communities, government agencies,

companies, professionals, and academics. This event has been held since 2022, making it quite recent, occurring successively in São Luís/MA, Santos/SP, Itajaí/SC, and Paranaguá/PR. It is undoubtedly a driving measure that motivates the sector as a whole and the port innovation production chain. However, one must ask to what extent these events translate into and contribute to the fostering and consolidation of the desired organizational culture dedicated to innovation.

Professor Jim Euchner explains, in general terms, that *"One can say that an organization has an innovation culture when it supports those individuals (who take the risk of innovating) and makes it possible for new and bold things to happen with some regularity. Unfortunately, in many organizations, it is almost impossible to be truly innovative"* (Euchner, 2016). This results from the fact that a very "operational" organization, focused solely on the immediate problems of daily life, is inherently resistant to innovation as a permanent work process, since structured and systematic innovation brings forth questions and potential changes that may "disturb" the equilibrium of the environment and challenge the *savoir-faire and modus operandi*.

C. Crews, J. Euchner, and A. Kates utilize the myth of the *"Hero's Journey"* to describe how leaders within an organization can lead a *"Journey of Innovation Culture"* from the perception that there is *"something"* threatening the existence or balance of the organization in an environment that demands rapid change. For this reason, the Hero must undertake a process of change (The Journey) to establish a new condition of equilibrium that provides greater security for the organization or society, producing learning and competitive advantages throughout their journey (Crews, Euchner, Kates, 2022).

Focusing on the maritime transport sector, M. Acciaro and C. Sys, researchers from the Universities of Hamburg and Antwerp, respectively, assert that although significant effort is made to encourage companies in this sector to innovate through various projects, programs, and resources, *"little is known about the processes and mechanisms that lead to successful innovation, resulting in initiatives that are often uncoordinated, unfocused, poorly managed, and do not produce the expected outcomes"* (Acciaro and Sys, 2020). This is a challenging equation that requires collective reflection and a better understanding of the port environment.

This discussion becomes even more complex when one understands that innovation, as a process that is both creative and a result of organizational knowledge and culture, is not verticalized within the same firm, self-sufficient, or isolated from the external world. On the

contrary, it is a diffuse collective construction that heavily relies on external actors to the Port Authority, such as government agencies, funding bodies, private partners, universities, and R&D centers (see the Triple Helix model). This is the current paradigm of "*Open Innovation*" to the external world, in the Knowledge Society, amidst Social Networks and Artificial Intelligence.

In a literature review aimed at understanding why the port sector, in general, is often perceived as lagging in terms of innovative initiatives ("*low-tech*"), T. Vanelslander, C. Sys, and other researchers conducted an extensive review of literature from the period of 2011-2018 regarding the sector. These authors proposed a typology of specific innovations for the port sector, which encompasses not only technological innovation but also innovations in management, organization, and corporate culture, whether aimed at the business itself or the operating market (Vanelslander, Sys, Lam et al., 2019). This type of approach is very welcome, as previously explained, the Port Authority possesses a multiplicity of facets and dimensions that prevent a one-dimensional solution to innovation, for instance, one that is exclusively technological and verticalized. Simply put, that does not work in this case.

In contrast, Paulo R. Lopes (2022) studied the case of innovation through the lens of intellectual property management in the specific case of the Maranhão Port Administration Company – EMAP, the Port Authority of the Port of Itaqui, in São Luís, State of Maranhão, Northeast Brazil. After conducting semi-structured interviews with the company's managers responsible for innovation initiatives, the researcher inferred the following:

"The managers understand that the main advantages arising from the innovation initiatives for the Port of Itaqui are: the development of an innovation culture, the development of solutions for port problems, productivity, and improvement in the port-city relationship" (Lopes, 2022, p. 115).
"Finally, regarding the existence of an innovation culture and whether innovation is part of the organization's strategic planning: all managers agree that there is a culture, and that innovation is viewed strategically for the performance of their activities" (Lopes, 2022, p. 117).
"Although EMAP has not formally highlighted innovation processes in its regulations, it was possible to perceive that the Port of Itaqui allocates human and financial resources to port innovation initiatives, managed through programs and projects. The responsibilities for innovation are distributed across various directorates and management levels, with everyone collaborating on the development of innovation actions. Thus, one can observe the

effort of the Port of Itaqui to establish an organizational structure focused on open innovation and the creation of a Maranhão port innovation ecosystem" (Lopes, 2022, p. 135).

It is noteworthy in the cited study that the area of the company deemed responsible for innovation is the *communication* advisory through the *"Port of Itaqui Lab"*, although other areas and employees participate directly in the innovation projects and initiatives, organized in the form of a working group. As the study indicates, this approach is still fragile, horizontal, and distributed within the Port Authority due to the lack of a robust dedicated organizational structure; however, at the time of the study, it had the full sponsorship of the CEO, which is a *sine qua non* condition for long-term innovation within the company to undergo its process of significant structuring and consolidation.

It should be clear that this article does not advocate for the necessity of a *pre-existing* innovative culture within port authorities or any organization for the innovation process to occur. What happens is a simultaneous and reciprocal movement of conducting innovation via projects while simultaneously developing an organizational knowledge and culture, in the sense of Nonaka and Takeuchi (1995), provided there is continuity.

This dynamic, if adopted and structured by the company's top management, fosters the development and consolidation of a culture of innovation. The objective action of executing and developing innovative projects may lead to a culture of innovation, provided that the conditions and facilitators, as described by Isidro-Filho (2018), persist and are reinforced over time. An organizational culture requires time to consolidate and needs projects and investments to materialize on a long-term basis. Projects require people and financial, material, and temporal resources for maturation and development. People need incentives, support, and backing from the hierarchy to perform their work with safety and certainty that they are being supported, and not a Hero to face a heroic journey. This is the virtuous cycle that should be pursued. Therefore, the focus of attention shifts from a purely technical perspective to a *sociotechnical* approach to innovation, in order to understand what those conditions might be within a Port Authority.

The antithesis of this would be the mere execution of innovation projects in a short-medium term, with interruptions following the first turnover in management, resulting in consequences such as internal reorganization and changes in corporate strategy.

A quick search online reveals many projects and programs labeled as innovative in Brazilian

ports and port terminals; however, it does not confirm the persistent and consistent structure behind these projects and their necessary regulatory foundation (keeping in mind that these are public enterprises), which only underscores the urgent need for a dedicated public policy that provides guidelines and mechanisms for consistent innovation.

For this reason, many of the examples observed in the daily operations of Brazilian public ports refer more to public procurement or initiatives with endogenous and scarce resources, whose passage (or communication) or perception by the market (port operators, clients of port services, communities, and society at large in port cities) is not evident and is complex and difficult to measure.

To verify whether and how Brazilian port authorities communicate their innovative culture, a preliminary survey was conducted on the websites of 15 of the country's main port authorities from January to March 2025, regarding minimum components related to the culture of innovation, both for ports managed by dock companies and for delegated ports managed by state public enterprises, which indicated the following:

Table 2 – Results of a preliminary survey in 15 Brazilian port authorities regarding components that clarify the culture of innovation. (MPOR, own elaboration).

Component	Results
Bylaw of the Port Authority	No bylaw explicitly contains an article, clause, or reference to innovation as a strategy, technological development, or equivalent.
Organizational structure dedicated to innovation	Two port authorities have a structure with an innovation function, but one of them focuses on training. Three other authorities report having a committee, commission, or working group explicitly created to address innovation, including one of them having an "innovation center." One authority explicitly mentions the creation of an innovation laboratory.
Internal policies on innovation or administrative acts referencing innovation, research, and technological development.	Four companies have acts that explicitly refer to innovation and technological development.
Communications regarding initiatives, programs, projects, or actions in innovation.	Fifteen or the entire sample presents information on websites regarding the execution of programs, projects, and partnerships in innovation.
Section dedicated to R&D&I in the Annual Management Reports	No specific section dedicated to innovation was identified in the consulted reports (2023 and 2024), but all 15 companies mention the development of projects and investments in training and innovation or modernization projects in these reports.
Bids and public procurement contracts dedicated to innovation infrastructure (R&D&I; laboratories; centers)	In two port authorities, explicit references to bidding or contracts involving research projects, studies, technological development, or innovation were found. On the other hand, some public purchases were focused on innovative projects within the company.

It is noteworthy to highlight in Table 2 that all the port authorities surveyed state on their websites that they develop innovation projects or actions, including professional training. In a hasty conclusion, one might think that the organizational cultural problem is resolved since projects are underway. Nothing could be further from the truth. This preliminary survey indicates a fragility in the function of innovation within the port authorities due to the absence of disseminated internal policies, specific regulations, dedicated organizational structures established in the official documents of the companies, and so forth. In reality, there is a diversity of models and alternatives adopted in a somewhat unstructured manner, with significant disparities among the authorities, as well as various gaps to fill and opportunities for enhancement within the companies, aimed at establishing an appropriate and enduring internal model or organization for the development of the Innovation & Innovation Culture framework. There are initiatives, efforts, and investments on the part of some of these companies, but they remain poorly structured and incipient at a systemic

level and at the company level itself.

On the other side of the spectrum of types of innovative project approaches, there is the "Top-Down" method, defined as a mandatory, not voluntary, public policy. This method was applied by Brazilian Government to the success case of the Paperless Port system explained below.

Paperless Port System (PSP): A Brazilian Case of "Top-Down" Port Innovation

The Paperless Port ("PSP") is an information system developed and implemented from 2011 for the Brazilian public ports, becoming mandatory from 2013 onwards, which serves as the *"Maritime Single Window"* (MSW) of the port system.

The system was developed by the Federal Data Processing Service – SERPRO, a federal public company specialized in ITC and Digital Transformation solutions, based on demand from the former Ports Secretariat of the Presidency of the Republic.

Before the PSP implementation, shipping companies spent considerable time filling out approximately 2000 information fields, many of which were repeated, on 112 paper forms for each ship/docking/operation, which were later presented in person to the corresponding inspection authorities.

Through the PSP, federal agencies that authorize and control the docking, operation (loading/unloading) and undocking of ships share and exchange information, in order to reduce time and costs. All information is shared by all authorities through a Single Digital Document called "DUV" with 935 information fields. The main objectives of the system are minimizing bureaucracy by eliminating overlapping processes, redundancies, paper forms and licenses, promoting agility, efficiency, and transparency on the lineup of vessels and cargos.

The system is currently present in thirty-four public ports and 150 private terminals. In terms of objective recent results, the following should stand out:

- Reduction in the total lead-time for docking authorizations, from an average of 180 hours in 2013 to 45 hours in 2024 (75% less);
- Effective average operating time/year: from 83.3 hours (2023) to 76.7 hours (2024); and

- Average reduction in docking costs/year: R$ 1.32 billion (approximately USD 234,127 million/year).

These results have direct effects on greater availability of berths in the port, more information for planning ship line-ups and reducing total idle time, with an increase in the annual revenue of port authorities.

Also, the International Maritime Organization (IMO) has formally recognized PSP as Brazil's Maritime Single Window. In this sense, Brazil was invited to present that case at the 48th session of the Annual Meeting of the Facilitation Committee (FAL) together with other countries in April 2024 [8].

For the purposes of this article, it is important to highlight in that case that the dissemination and implementation of the PSP was a mandatory determination of the Federal Government at the time, which lead to several debates and questions from Port Authorities and Port Communities in first years. In fact, this innovation required and brought significant impact and changes that led to the transformation of the way shipping companies and freight brokers, government agencies and port authorities managed and operate vessel stays in ports.

The authors of this paper participated directly in the development and implementation process at the time and there were some mindset change challenges at the time that were overcome so PSP could evolve and follow its path over the years. The risk was to interrupt or distort the project during the learning curve development.

In spite of the positive results obtained after thirteen years (2011-2024), the potential of the PSP has not yet been properly explored by all port authorities, despite current functionalities that make it feasible, for example, through integration with other port management systems, such as ERP, PMIS, VTMIS, PCS, or technologies as Machine Learning and Big Data Analytics, among others. From the Federal Government side, the next steps are to integrate PSP to Foreign Trade Single Window and applying Artificial Intelligence (AI) to improve agency authorizations to vessels. One might ask why these initiatives are not taken on a large scale, given that the platform is user-friendly for this purpose.

The hypothesis here is that such mismatch between opportunities offered by the PSP platform and the lack of integrations and added public value clearly reinforces the need for

a broader understanding of what is involved in such projects and the learning process, far beyond technology change, but in terms of impacts on innovation process and culture of innovation.

The Urgency for the Development and Consolidation of a Culture of Innovation

Given this scenario, one might ask what would constitute an adequate and user-friendly framework that establishes a favorable, institutionalized, and structured environment within Port Authorities, in which the consolidation of a corporate innovation culture is the responsibility of the interest and actions of the individuals working there.

In light of the current challenges faced by Port Authorities, the rapid pace of technological changes, and the volatility of macroeconomic scenarios exacerbated by extreme climatic events, among other circumstances that generate risks and uncertainties, the urgency to develop an culture of innovation within Port Authorities becomes evident as an indispensable vector for optimizing and benefiting from sectoral innovation investments.

It is unreasonable to have a corporate strategy solely dedicated to addressing the classic day-to-day problems of a public port, considering the entire dynamics in which those challenges coexist, without an innovation culture, as advocated in this article.

Given that Port Authorities are public enterprises created by Federal or State Law and are subject to the legislation applicable to Brazilian public administration, several fundamental elements can serve as guidance for the appropriation and consolidation of an Innovation Function that ensures fertile ground for the development of an innovation culture. By way of suggestion, and in a non-exhaustive list, the following elements are proposed:

a) *Explicit mention of innovation in the company's Bylaws and in its Institutional Strategic Planning:* here, innovation becomes institutionalized and communicated throughout the company;

b) *Existence of an organizational structure focused on innovation governance (board level, board of directors or superintendency, and respective team, with appropriate roles and functions):* this ensures the necessary organization for governance, assigning clear roles and responsibilities;

c) *Explicit and permanent inclusion of the topic of innovation in the company's Board of Director's meetings:* the board members represent shareholders and key stakeholders who influence the company's decisions;

d) *Explicit and permanent inclusion of the topic of innovation in the Port Authority Council (CAP) meetings:* this body gathers representatives from the port community and public and private entities that work daily within the company and at the port;

e) *Publication of a regulation with an internal innovation policy that includes clear and measurable processes and objectives:* this institutionalizes the company's innovation system model, its management, governance, processes, stages, and rules;

f) *Publication of a regulation with an internal Intellectual/Industrial Property Policy:* this institutionalizes the management of the company's strategic assets resulting directly from innovation investments, protecting the generated products with potential corporate, economic, legal, and social effects;

g) *Publication of planning documents dedicated to or explicitly containing a chapter on innovation – programs, projects, business plans, initiatives.:* this complements item "a," as it unfolds into other planning instruments that are communicated to the company and the market;

h) *Provision for budgetary actions dedicated to addressing the annual innovation portfolio:* these are fundamental prerequisites to secure financial resources according to the annual budget cycle;

i) *Strategy and initiatives for obtaining external funding for R&D&I:* these leverages available public and private resources in the market and Public Agencies for research, development, and innovation activities;

j) *Construction and consolidation of a network of partnerships and cooperations Port Authority-centered, with the company's insertion and operation in the local or regional R&D&I ecosystem:* this prevents the complete verticalization of the innovation function, adopting the current paradigm of open innovation, with shared risks and resources;

k) *Permanent training program for managers on innovation topics:* it is essential for consolidating and perpetuating knowledge about innovation within the managerial and technical staff of the company;

l) *Permanent incentive program for employees or collaborators who excel in the field and in innovation activities:* in public enterprises, there are defined positions, roles, and careers. Such incentives allow for the establishment of a progression and promotion pathway for public employees and other collaborators;

m) *Development of a communication plan dedicated to issues and products resulting from innovation, including internal events and others open to the public:* this involves both internal and external communication (company, market, society), which is strategic and crucial for the success of ventures and the dissemination of their results; and

n) *Maintenance of a transparent compliance control system, goals, and indicators for evaluating innovation and the outcomes of investments:* this enables assessment for strategic and portfolio management purposes, as well as control and auditing (compliance), as proposed by OCDE and Oslo Manual.

These measures, referred to as "*structuring*" elements, have a dual objective: to reduce barriers and support the facilitators of innovation, as described by Isidro-Filho (Table 1).

With such elements gradually and consistently implemented, the innovation function would become less dependent on the personal will of individual Port Authority managers or the fragility of temporary innovation programs, while also conveying security and confidence to employees that it will be a regulatory obligation for the manager in a leadership position to adhere to the established provisions, such as the Bylaws and the determinations of the Board of Directors.

At first glance, this may seem like a very hierarchical, rigid, and excessively prescriptive approach, but it should be understood more as a means to incorporate the characteristics and idiosyncrasies of the public sector in favor of the perpetuation of innovation, respecting legal principles such as impersonality, efficiency, and transparency, through the necessary formalization (*Positive Law*) when discussing public institutions.

As a potential consequence of this type of approach, once implemented, it could assist in the lengthy process of certification under ISO 56001 and 56002 standards, dedicated to Innovation Management Systems (IMS), should it be of interest to each company.

In other words, the aim is to avoid the necessity for a "hero" to undertake a hard journey of challenges, with all the risks that entails, and to ultimately provide the opportunity to collectively construct their perception and understanding of a culture of innovation within

the organization. A mere change in management could potentially nullify the entire journey.

It is for these reasons that culture is not imposed by Law or Regulation, although it requires them for its structuring and perpetuation; rather, it is constructed by the employees of the Port Authority in cooperation with the port community. Being a necessarily collective and complex construction, the innovation culture requires continuity in a rational, structured, and consistent manner, and the proposed structuring elements can serve as a framework for this purpose.

This proposal would be compromised and questionable if it did not also include the role and actions of the Ministry of Ports and Airports, the central body responsible for formulating policies and guidelines for the development and promotion of the port and waterway transportation sector, as well as the corresponding measures, programs, and projects to support the development of the infrastructure and superstructure of the Country's ports.

Since approximately 2008, the central bodies responsible for formulating port policies have sought to develop, finance, and implement programs for the modernization of port management and innovation projects in Brazilian public ports. However, to date, there has been no proposal or implementation of a national policy dedicated to port innovation.

Two initiatives are currently underway to address the gaps required by the "Innovation – Culture of Innovation" framework: the "Navegue Simples" (*"Simplified Navigation"*) Program and the "Caravanas da Inovação Portuária" (*"Port Innovation Caravans"*).

Simplified Navigation Program and Port Innovation Caravans: The Journey in Pursuit of Developing an Innovation Culture from the Central Public Policy Formulation Agency

It would be not fair to assign exclusively and entirely to public Port Authorities the individualized role of formulating, constructing, and consolidating their approach to and for innovation, without a general guideline applicable to all these entities that could provide a foundational level of orientation in the form of public policy.

As the central body responsible for formulating sectoral port policies, it is incumbent upon the Granting Authority exercised by the Ministry of Ports and Airports (MPOR) to define which policies are aimed at fostering innovation and facilitating the development of an

innovation culture. In this regard, two initiatives are underway to structure and stimulate innovation and the culture of innovation within the port sector in a broad sense.

Simplified Navigation Program

This is a policy in terms of a strategic program dedicated to measures of deregulation, innovation, and simplification of all types of port grants, as defined by Law 12815 of 2013. This program aims to innovate by reducing administrative and regulatory times and costs by half, enabling private investors to obtain a new grant contract or amend an existing contract in the shortest time possible. Currently, this time ranges between 3 to 5 years, and it can extend depending on the complexity of the project, which is excessive, given the new reality that demands greater efficiency and speed to initiate new investments in the port sector.

The program was formally established by Decree 12078, dated June 25th, 2024, and resulted from a partnership between the Ministry of Ports and Airports and the National Waterway Transportation Agency – ANTAQ. Among its objectives are to promote, disseminate, and implement (BRASIL, 2024a):

a) Research, development, and innovation activities in the port sector; and
b) Activities for the absorption and transfer of technologies applicable to port grants, particularly those dedicated to improving port governance, port-city relationships, and the effects of climate change.

The program is permanent and organized into four-year cycles, divided into “waves” of 12 months each, allowing for the achievement of short, medium, and long-term results. The first “*wave*” of the first cycle will conclude in August 2025, with one of its goals being to define the port innovation policy.

In addition to the main objectives of deregulating and innovating, Navegue Simples also aims to establish conditions, instruments, and processes to:

- Improve the efficiency of public policies for port grants;
- Promote the reduction of regulatory burdens, with criteria for review, unification, harmonization, consolidation, transparency, predictability, and legal security;
- Articulate, structure, and develop, at the federal level, cross-cutting policies and coordinated measures to promote greater efficiency and socio-environmental

sustainability in the exploration of authorized ports and port facilities;
- Stimulate competitiveness and competition in organized ports, authorized facilities, and port activities supported by grant contracts.

Subsequently, through Ordinance MPOR 441, dated September 19th, 2024, the Interinstitutional Technical Committee of the Program was established, which includes, in addition to MPOR and ANTAQ, representatives from the Civil House of the Presidency of the Republic; the Ministry of Management and Innovation in Public Services; the Ministry of the Environment and Climate Change; the Ministry of Development, Industry, Commerce, and Services; and the Brazilian Institute of Environment and Renewable Natural Resources – IBAMA. The private sector actively participates through six technical groups (TGs) created under the coordination of the Interinstitutional Technical Committee (BRASIL, 2024b):

- TG-01. *Simplification and deregulation of critical MPOR and ANTAQ processes for Private Terminals;*
- TG-02. *Environmental Licensing of Private Port Facilities outside organized ports;*
- TG-03. *Allocation of land and physical spaces in public waters of the Union for ports and port facilities;*
- TG-04. *Simplification and deregulation of leasing processes for areas in Organized Ports;*
- TG-05. *Mitigation and adaptation to climate change*; and
- TG-06. *Innovation in the port environment.*

The TGs have a limited duration (6-12 Months) but can be extended, and others may be created in the future. The working method is highly dynamic, adapting to the needs and context, and can adjust based on the restrictions and demands of each situation. There are many possibilities within an innovative and transformative agenda.

Port Innovation Caravans

The *"Caravanas da Inovação Portuária"* complement the actions of *Navegue Simples* Program, as they focus on the issue of Culture of Innovation. This is a traveling initiative aimed at developing, disseminating, and promoting the culture of innovation in Brazilian public ports, within the regions and contexts in which they are located. The fundamental reason that inspired and motivated the conception and proposal of the "Caravanas da Inovação" was the urgent need to consolidate a Culture of Innovation, as advocated in this article.

As previously clarified, it is not only urgent but also essential for the port sector to create a virtuous movement of transition and transformation within port authorities and public ports. This movement should shift from the current scenario characterized by individualized projects initiated by visionary managers without a connection to a long-term strategy, to a scenario of broad and sustainable innovation that is described as "open" or collective, disseminated and appropriated by local actors in the port community and the regional and national science and technology ecosystem, regarded as an indispensable strategic asset for public ports, their respective communities, and their businesses.

In this context, the Ministry of Ports and Airports has defined the following objectives for the "*Caravanas da Inovação Portuária*":

- To draw attention to and raise awareness among the Managers of Public Port Authorities and the Port Community as a whole, by promoting the strategic importance of adopting innovation as a tool for improving organizational, managerial, social, environmental, and operational efficiencies of ports as public assets and organizational structures that generate public value;
- To organize and conduct events and activities in public ports focused on the development, dissemination, and promotion of the Culture of Innovation, involving the local Port Community, research, and development initiatives with scientific, technological, and innovation institutions, and other public and private entities; and
- To disseminate models, legal frameworks, and national experiences of sectoral innovation, with the aim of adopting best practices, reducing risks and errors, and consolidating innovation in public ports.

The target audience for the Caravanas comprises:

- Companies located in or operating within public ports: port operators and their permanent service providers;
- Shipping companies;
- Companies located in the port back area;
- Clients and users of port services located in the state where the visited Port Complex is situated;
- Technology-based startups with operations or interest in the port and waterway transportation sector;
- Technology-based companies of any size with operations or interest in the port and waterway transportation sector;

- Non-governmental organizations focused on socio-environmental issues;
- Scientific, Technological, and Innovation Institutions – SCI;
- Entities that promote and finance innovation; and
- Researchers, educators, students, and professionals interested in innovation in the port sector.

The "*Caravanas da Inovação Portuária*" are structured around the following axes:

I – *Inspire*: This refers to communication, dissemination, and guidance or mentoring activities. For example: lectures, workshops, seminars, publications on social media, newspaper articles, interviews, model analyses, preparation of action plans, institutional advice, etc.
II – *Share*: This pertains to activities for exchanging information and experiences; and
III – *Connect*: This involves activities for articulation, dialogue, creation of physical local networks and arrangements with national and local actors, as well as virtual arrangements with actors from other regions and countries, within the logic of "Open Innovation".

For the medium term and long term (beyond four years), the desired outcomes for the "*Caravanas da Inovação Portuária*" are as follows:

- A consolidated Culture of Innovation in the public ports of the country;
- Port Authorities recognized and integrated into the National Science, Technology, and Innovation System (SNCTI) as operators of R&D&I, including public ports as environments that promote innovation; and
- A portfolio of port R&D&I projects with specific budgetary resources allocated in the annual budgets of port authorities.

This initiative is permanent, and throughout 2025, six Caravanas da Inovação are being conducted in the cities where the public ports of Recife, Salvador, São Luís, Fortaleza, Rio de Janeiro, and Santos are located. In 2026, it will be the turn of authorities from the northern and southern regions of the country, after which the circuit will resume itinerantly, in a progressive process of dissemination.

Conclusions and Issues for the Research Agenda

This article aimed to discuss the binomial of innovation & culture of innovation within the

port authorities of Brazil, public entities that manage the thirty-five public ports across the country, from North to South. The starting question was how to urgently develop and consolidate a culture of innovation within the port authorities.

Through a brief survey of information available on the websites of 15 Port Authorities, it was possible to identify existing initiatives, efforts, and investments in some of the major companies, which is already a positive and motivating sign, although still somewhat unstructured and incipient at a systemic level, which ultimately reflects on the public ports

Beyond the usual challenges these companies face in their daily operations, there are issues that increasingly demand space and resources for management and the addressing of solutions, such as the port-city relationship and the effects of climate change.

Some of the studied public ports exhibit greater maturity in the structured execution of innovation and in understanding the importance of an innovation culture, encouraged by visionary managers. However, while all port authorities claim to undertake innovation projects and indeed do so, this does not guarantee the collective construction of an innovation culture within the organization and the sector. To this end, the article proposed several structuring elements that, if present within the company, will provide a solid and secure framework for the sustainability of innovation investments and the emergence of a culture of innovation.

The main conclusion drawn at this moment is that without the construction and appropriation of an culture of innovation by Port Authorities and their employees, the trend will be the continuation of isolated short-medium terms projects, annual events, and public purchases classified as innovation, but lacking a connection to a consistent long-term corporate strategy and the resolution of structural problems currently on the agenda. The greater risk is investing in initiatives that do not produce new knowledge, skills, and, most importantly, new corporate capabilities within port authorities as public entities. Once the projects and events conclude, knowledge disperses, and opportunities are lost. And new projects begin…
As measures to support and encourage the development and consolidation of innovation and an innovation culture, the Ministry of Ports and Airports has developed and implemented the *Navegue Simples* Program and the *Caravanas da Inovação Portuária*. The first aims to deregulate, simplify, and innovate port grants. The latter seeks to develop, disseminate, and promote the culture of innovation in Brazilian public ports at both local and national levels. From these reflections, which is primarily collective, other equally legitimate and

fundamental questions arise almost instantaneously, as in a virtual brainstorming session, warranting greater attention and reflection to construct feasible responses, thus motivating further studies, research, debates, and collective initiatives to build knowledge and capacities:

– Is the Brazilian port model and its current legal framework conducive and inviting to research, development, and innovation?
– Why is the culture of innovation not yet a recognized and widespread reality in the national port system?
– Why have Brazilian port authorities not effectively appropriated innovation as a key asset of their competitive strategy, both for commercial and competitive purposes and for fulfilling their socioeconomic role as administrators of a national public good, i.e., the port?
– How can Brazilian public ports become true self-sustaining public environments that promote and drive innovation, serving as loci for new ventures, true technological parks or hubs, and inseparable from the national ecosystem of Science, Technology, and Innovation?

HEAD IMAGE | *Aspects of the Port of Imbituba, in the State of Santa Catarina – Brazil. (Source: UNESC).*

NOTES

[1] Data available in the Antaq Statisticals at: https://web3.antaq.gov.br/ea/sense/index.html/.
[2] The Brazilian port model is based on the coexistence of both the landlord port, consisting of public ports managed by public port authorities and operated by private terminals, as well as other private terminals authorized to operate outside the jurisdiction of a public port

authority. Source: ANTAQ.
[3] On the matter, the following reference is recommended: GOMES, L. 1808. Ed. Globo, 1st Ed., Rio de Janeiro, 2014, 384 p.
[4] Available at: https://brasil.un.org/pt-br/88191-acordo-de-paris-sobre-o-clima. Accessed on April 4, 2025.
[5] Available at: https://news.un.org/pt/story/2025/03/1846766. Accessed on April 4, 2025.
[6] A definition of Public Value is provided by Decree 9203, of November 22, 2017: "*products and results generated, preserved, or delivered by the activities of an organization that represent effective and useful responses to the needs or demands of public interest and modify aspects of society as a whole or of specific groups recognized as legitimate recipients of public goods and services*".
[7] By way of example: the National Institute of Technology was created by Decree 22750 of May 24, 1933; the National Council for Scientific and Technological Development – CNPq was created by Law 1310, of January 15, 1951; and the National Fund for Scientific and Technological Development – FNDCT was created by Decree-Law 719, of July 31, 1969.
[8] For further information: https://www.imo.org/en/MediaCentre/MeetingSummaries/Pages/FAL-48th-session.aspx?ref=marineregulations.news (Accessed on April 4, 2025).

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