

Regional innovation policies: a strategic roadmap proposal for institutional modernization

Políticas de inovação regional: proposta de roadmap estratégico para modernização institucional

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Abstract

Innovation is a strategic driver for industrial competitiveness and sustainable economic growth, fostering productive modernization and strengthening supply chain resilience. In Brazil, national policies such as the Nova Indústria Brasil Plan (2024–2026) and the Strategic Map of the National Confederation of Industry (2023–2032) establish guidelines to enhance the industrial sector, but their effectiveness depends on adaptation to regional specificities. This study proposes a strategic model for the regionalization of innovation policies, using the implementation process in the state of Acre as a reference, based on document analysis of the National Service for Industrial Training (SENAI/AC) and national and regional regulatory frameworks. A qualitative approach was adopted, systematizing primary and secondary sources to identify gaps in the articulation between national guidelines and local demands. The results reveal that, despite institutional advances, the absence of a structured policy undermines the integration between the productive sector, government, and academic institutions. To address this gap, a strategic implementation roadmap was developed, organized into four stages: Diagnosis and Planning, Policy Structuring, Implementation and Integration, and Monitoring and Improvement. The model seeks to strengthen innovation governance and ensure continuous adaptation to regional dynamics, promoting the modernization of the local industrial sector and its alignment with national reindustrialization strategies. It is concluded that structuring regionalized innovation policies, anchored in flexible governance models, can boost local competitiveness, facilitate investment attraction, and consolidate institutions as strategic agents of industrial development.

Keywords: Public Innovation Policies; Technological Development; Regional Governance Model; Industrial Innovation; Strategic Roadmap.

Resumo

A inovação é um vetor estratégico para a competitividade industrial e o crescimento econômico sustentável,

impulsionando a modernização produtiva e a eficiência das cadeias produtivas. No Brasil, políticas nacionais como o Plano Nova Indústria Brasil (2024–2026) e o Mapa Estratégico da Confederação Nacional da Indústria (2023–2032) estabelecem diretrizes para fortalecer o setor industrial, mas sua efetividade depende da adaptação às realidades regionais. Este estudo propõe um modelo estratégico de regionalização da inovação, tomando como referência o processo de implementação de políticas no estado do Acre, a partir da análise documental do Serviço Nacional de Aprendizagem Industrial (SENAI/AC) e de normativas nacionais e regionais. A pesquisa adotou abordagem qualitativa e sistematizou fontes primárias e secundárias para identificar lacunas na articulação entre diretrizes nacionais e demandas locais. Os resultados revelam que, apesar dos avanços institucionais, a ausência de uma política estruturada compromete a integração entre setor produtivo, governo e instituições acadêmicas. Para enfrentar essa lacuna, foi desenvolvido um roadmap estratégico de implementação, estruturado em quatro etapas: Diagnóstico e Planejamento, Estruturação da Política, Implementação e Integração, e Monitoramento e Aperfeiçoamento. O modelo busca fortalecer a governança da inovação e garantir a adaptação contínua às dinâmicas regionais, promovendo a modernização do setor produtivo e a inserção regional nas estratégias nacionais de reindustrialização. Conclui-se que a estruturação de políticas de inovação regionalizadas, ancoradas em modelos de governança flexíveis, pode impulsionar a competitividade local, facilitar a captação de investimentos e consolidar instituições como agentes estratégicos do desenvolvimento industrial.

Palavras-chave: Políticas Públicas de Inovação; Desenvolvimento Tecnológico; Modelo de Governança Regional; Inovação Industrial; Roadmap Estratégico.

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1. Introduction

Innovation is recognized as one of the pillars of industrial development, promoting gains in competitiveness and economic sustainability (Ghobakhloo et al., 2021). Globally, public policies have played a fundamental role in stimulating innovation ecosystems and strengthening production chains. In Brazil, the Action Plan for Neoindustrialization 2024–2026 aims to boost technological modernization and industrial productivity (Brasil, 2025). However, the effectiveness of these guidelines depends on the ability to adapt them to regional contexts, taking into account local environments, programs, and the integration between institutions, public policies, and the productive sector (Laplane et al., 2023).

Each Brazilian state exhibits specific economic, structural, and productive characteristics that influence how national innovation policies are implemented. Regional success, therefore, depends not only on institutional alignment with federal strategies but also on the capacity of local actors to coordinate and mobilize resources (Cirani et al., 2021; Silva et al., 2025a). In this context, sectoral organizations, educational institutions, and development agencies must act as active intermediaries, translating national directives into regionally coherent strategies and fostering collaboration among stakeholders (Lotta, 2019).

The National Industrial Training Service (SENAI) plays a central role in professional training and in fostering innovation within the Brazilian industrial sector. In addition to providing skilled labor, the institution also offers technological support to companies. In the state of Acre, SENAI/AC has sought to strengthen the innovation ecosystem, although it still lacks a formalized structure to systematize its actions in a continuous manner and one adapted to regional specificities (Maritan et al., 2024).

According to a diagnostic report by Fundação Certi (Sebrae, 2021), the innovation ecosystem in Acre is still in its early stages, showing nascent integration between key stakeholders and limited development of technology-based companies. An innovation ecosystem refers to the set of interconnected institutions, policies, and actors, such as companies, universities, and government agencies, that collaboratively promote innovation through knowledge exchange and coordinated efforts (Granstrand & Holgersson, 2020). In Acre, the weak interaction between the productive sector and research and development initiatives highlights the need for regionalized policies and institutional mechanisms for coordination. Despite the growing debate on regional innovation in Brazil, practical models for adapting national policies to low institutional maturity contexts, such as Acre, remain scarce (Silva et al., 2025b).

The absence of an institutionalized innovation policy limits the ability of Acre's industry to integrate into regional and national production chains. According to Gumiero (2023), overcoming this limitation requires the establishment of clear guidelines, implementation mechanisms, and monitoring processes aligned with both national directives and local specificities. In this context, the present study investigates the innovation process



within SENAI Acre, analyzing how the regionalization of national guidelines can optimize outcomes for the local industrial sector. SENAI, which is responsible for professional training and technological support for industry, operates nationwide, but its innovation initiatives remain fragmented, hindering the replication of best practices in regions with lower institutional maturity.

To address these limitations, this study proposes the construction of a roadmap for the formalization of SENAI/AC's Innovation Policy. The roadmap is presented as a strategic planning tool that organizes steps and defines priorities for implementing actions over time, aligning institutional operations with national guidelines and regional specificities.

This study aims to strengthen Acre's industry, expand its competitive capacity, and foster a more dynamic and technology-oriented business environment. By proposing a model for the regionalization of innovation, the work not only contributes to the integration of Acre into national reindustrialization strategies but also advances the understanding of how national policies can be practically adapted to regional realities, offering relevant insights for other regions facing similar challenges.

2. Theoretical Framework

Innovation plays a central role in economic and industrial development, driven by public policies that promote research, technological development, and productive modernization. In Brazil, the Legal Framework for Innovation (Law No. 10,973/2004) and its updates provide the regulatory basis for coordination between the productive sector, government, and academia, fostering an environment conducive to innovation (Brasil, 2004). However, challenges remain in decentralizing and adapting these policies to regional realities, requiring strategic approaches that consider local particularities.

2.1 Innovation Ecosystems and the Triple Helix Model

The Triple Helix Model, which emphasizes interaction between universities, companies, and government, has been widely used to structure regional innovation ecosystems, promoting synergies between academic knowledge and industrial application (Li et al., 2020). Collaboration among these three actors has the potential to accelerate productive modernization and increase industrial competitiveness, especially in developing countries. In a comparative study between Brazil and Portugal, Cezane and Tiossi (2021) highlight that efficient coordination among these spheres is essential for the implementation of effective innovation policies. In peripheral regions, where reliance on national guidelines may hinder adaptation to local realities, flexibility in regional strategy formulation is key to innovation success.

In Europe, the decentralization of innovation policies has been a key factor in industrial development across various regions. Regionally adapted governance models, aligned with local economic vocations, allow for greater integration between companies, research centers, and government policies. In this context, the European Union's regional policy seeks to stimulate

economic growth and employment through strategic investments (EU, 2024). The European Regional Development Fund (ERDF), one of the European Commission's main financial instruments, supports projects focused on innovation, research, and technological development, adapting to the specific needs of each region (Europarl, 2024).

In Brazil, initiatives such as the SENAI Institutes of Innovation demonstrate how decentralization can strengthen innovation in the industrial sector. These units foster the application of new technologies and enhance business competitiveness, adapting to regional demands (Galdino & Vilha, 2019). However, the absence of a formal model to integrate government, the productive sector, and academic institutions limits the effectiveness of these initiatives in some regions.

In the case of SENAI Acre, the weak coordination between government, local businesses, and technical education institutions hinders innovation progress and the creation of a robust ecosystem (Maritan et al., 2024). The Triple Helix Model, by emphasizing this interaction among the three agents, can serve as a reference for strengthening innovation governance in the region. However, its implementation faces challenges such as structural bottlenecks in infrastructure and investment effectiveness, the absence of formal cooperation mechanisms among local actors, and difficulties in retaining specialized talent (Silva et al., 2025b).

In the context of Acre, the recent approval of the Acre Innovation Law (Law No. 4132/2023) and the creation of the State Council for Innovation, Science, and Technology may represent significant legal advances, contributing to greater synergy within the regional Triple Helix. These initiatives aim to structure the ecosystem with shared governance, attract investment in technology, and stimulate scientific production (Acre, 2023). However, their success depends on the implementation of practical mechanisms that overcome fragmented actions and promote greater engagement from the private sector.

Thus, the establishment of specific regional policies, aligned with national guidelines and adapted to Acre's particularities, may be a path to overcoming these barriers. Building innovation networks involving SENAI, the productive sector, universities, and research institutes can boost the generation of applied knowledge, promote the absorption of new technologies, and increase the competitiveness of local industries.

To strengthen innovation in the state, the implementation of the SENAI Acre Innovation Hub is underway, integrating industry, academia, and the public sector, in line with the principles of the Triple Helix Model (Maritan et al., 2024). This hub has the potential to drive technology transfer, strengthen intellectual property protection, and enhance connections among innovation ecosystem actors, facilitating the application of scientific knowledge to the local productive sector.

The implementation of formal innovation processes would also expand SENAI Acre's ability to attract investment and structure strategic projects. Moreover, aligning intellectual

property management with regional policies and fostering collaboration between the public and private sectors would strengthen the local industry and reduce dependence on external solutions.

Strategic intellectual property management is an essential element for industrial innovation, as it enables the protection and application of generated knowledge within the productive sector. In Acre, the lack of formal guidelines in this area limits the transformation of knowledge into technological assets and its transfer to local companies. Considering these regional weaknesses, it is important to understand how Brazilian industrial policy seeks to address the challenges associated with innovation and the strengthening of productive competitiveness.

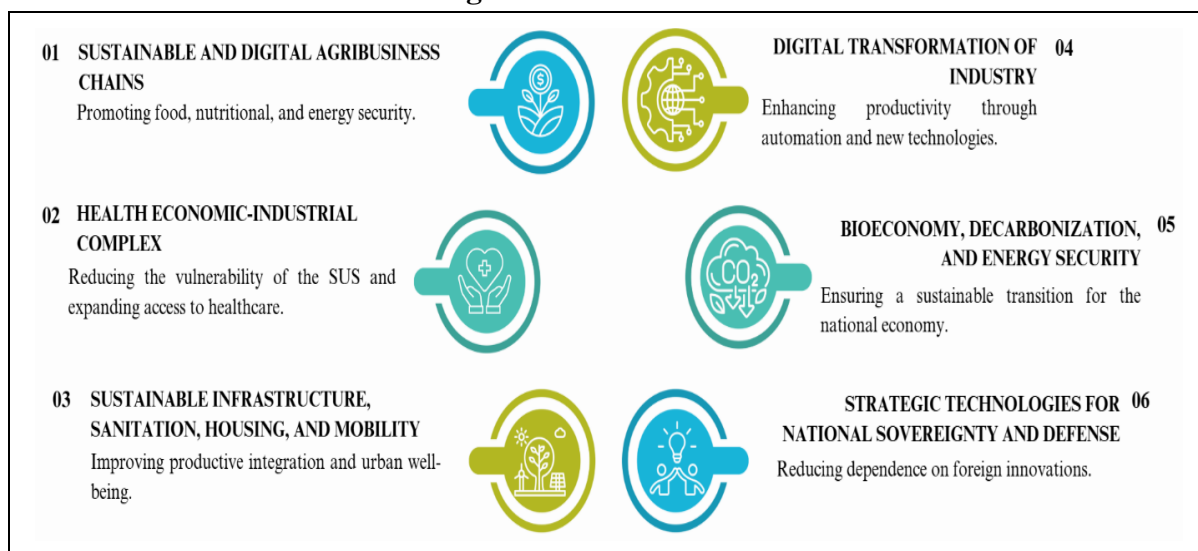
2.2 Brazil's Industrial Policy and the Challenges of Innovation

Brazil's industrial policy has undergone cycles of expansion and contraction, reflecting the country's economic transformations and structural challenges. Until the 1980s, Brazil followed a consolidated strategy to strengthen its national industry, supported by investments in sectors of high technological complexity (Silva et al., 2019). However, with trade liberalization and the reduction of state intervention in the productive sector, the country experienced a process of premature deindustrialization, characterized by a decline in the industry's share of GDP and the primarization of the economy (Trindade et al., 2016). This phenomenon resulted in a loss of international competitiveness and increased dependence on foreign inputs and technologies, making reindustrialization a central challenge for Brazilian public policy (Iasco-Pereira & Morceiro, 2024).

In recent years, there has been a broad debate on the need for a more structured and long-term industrial policy, capable of positioning Brazil in light of global technological transformations. In response to this scenario, the Nova Indústria Brasil (NIB) Plan was launched with the aim of integrating innovation, digitalization, and sustainability as pillars of productive development (Brasil, 2024).

The plan defines six strategic missions, each with specific objectives focused on industrial modernization. Figure 1 presents these missions, with emphasis on sustainability and digitalization.

Figure 1. Missions of NIB



Source: Adapted from Brasil (2025).

The execution of these missions is supported by nine transversal axes, encompassing tax incentives, intellectual property, credit and subsidies, regulation, public procurement, and technological development. The integration of these elements aims to modernize Brazil's productive structure, ensuring that its industry keeps pace with global technological transformations. In this context, understanding the role of industrial policies and the institutions responsible for innovation becomes essential to assess the effectiveness of the proposed strategies at the regional level.

2.3 The Role of Industrial Policies and Institutions in Brazil's Innovation Ecosystem

The National Confederation of Industry (CNI) plays a strategic role in formulating and advocating public policies aimed at innovation and productive development. The institution contributes to the construction of a regulatory environment favorable to industry, promoting studies and guidelines that guide the actions of both the government and the private sector (Mello & Gawryszewski, 2020). In this context, the NIB Plan was structured as a key instrument to drive industrial modernization, aligning investments in technology, sustainability, and innovation with the needs of the productive sector.

The Strategic Industry Map 2023–2032, developed by CNI, complements these guidelines by highlighting essential factors for industrial competitiveness, such as innovation, decarbonization, infrastructure, and productive development (CNI, 2023a). These factors guide the actions of the Industry System, composed of SENAI (responsible for professional training and support for technological innovation), SESI (focused on quality of life, health, and workplace safety), and IEL (focused on business education, management, and career development).

The SENAI plays a central role in this ecosystem, working both in professional qualification and in the development of technologies applied to industry. Its initiatives include specialized services offered through the network of SENAI Innovation Institutes, SENAI Technology Institutes, and Innovation Hubs, promoting integration between research and the productive sector (SENAI, 2024).

As in other regions, the activities of SENAI Acre must be adapted to local specificities to ensure effective impacts on the modernization of the state's productive sector. Despite progress in promoting innovation, challenges remain in the formalization of a structured policy that effectively guides its actions. The absence of a regionalized innovation policy limits the adaptation of national guidelines to local specificities, making it essential to develop strategies that strengthen regional autonomy in this process.

Creating an efficient innovation ecosystem in Brazil requires balancing national guidelines with regional strategies (Leal & Figueiredo, 2021). The strengthening of Brazil's industrial policy, driven by the NIB Plan, represents an important step in this direction. For these guidelines to produce concrete effects in peripheral regions such as Acre, they must be adapted to local productive, structural, and economic characteristics.

SENAI Acre, as the main agent of industrial innovation in the state, has the potential to play a significant role in this process (SENAI/AC, 2022). The formalization of a regionalized Innovation Policy, aligned with national initiatives, can strengthen the local industry, reduce dependence on external solutions, and expand productive capacity. By encouraging the adoption of new technologies, such a policy tends to increase the competitiveness of regional companies and better prepare them for market challenges.

According to Almeida et al. (2022), the coordination between government, the productive sector, and educational institutions is crucial to creating a favorable environment for innovation and driving integrated and sustainable regional economic development. In this sense, decentralization of innovation and the adoption of regional strategies are key to balancing Brazil's industrial development, fostering more dynamic and competitive growth.

3. Methodology

This study adopted a qualitative approach, based on documentary analysis of regulations, guidelines, and institutional documents related to innovation at SENAI Acre, in line with Morgan (2022), who highlights documentary analysis as an appropriate method for investigating organizational and institutional phenomena. The aim was to investigate the innovation process within the institution, assess the alignment of its initiatives with national and regional legal and strategic guidelines, identify structural gaps, and propose a strategic roadmap for the formalization of an Innovation Policy adapted to the local context.

To support the definition of analytical criteria, a systematic review of national and international literature was conducted, aiming to identify theoretical foundations on

regionalized innovation policies, institutional governance, and strategic innovation management. The search was carried out in the Scopus, Web of Science, and Scielo databases, considering publications from 2015 to 2025 in Portuguese and English. Studies with an applied or conceptual approach related to the formulation, implementation, or evaluation of public innovation policies with a regional focus were included. Articles focused exclusively on corporate innovation without connection to public policies, as well as works lacking a clear methodological scope, were excluded.

The documentary analysis was guided by criteria defined from the literature review on regionalized innovation and policy management, following the methodological approach proposed by Meydan and Akkaş (2024), who emphasize systematic document analysis as a source of qualitative data and a triangulation tool in applied research. These criteria included: (i) the degree of strategic alignment between national guidelines and SENAI Acre's initiatives; (ii) the definition of goals and priorities in innovation policy formulation; (iii) the evaluation of implemented actions and their impact on the local industry; and (iv) the assessment of governance and monitoring instruments used in innovation management. These criteria were defined based on elements identified in the literature a fundamental for the effectiveness of regional innovation policies.

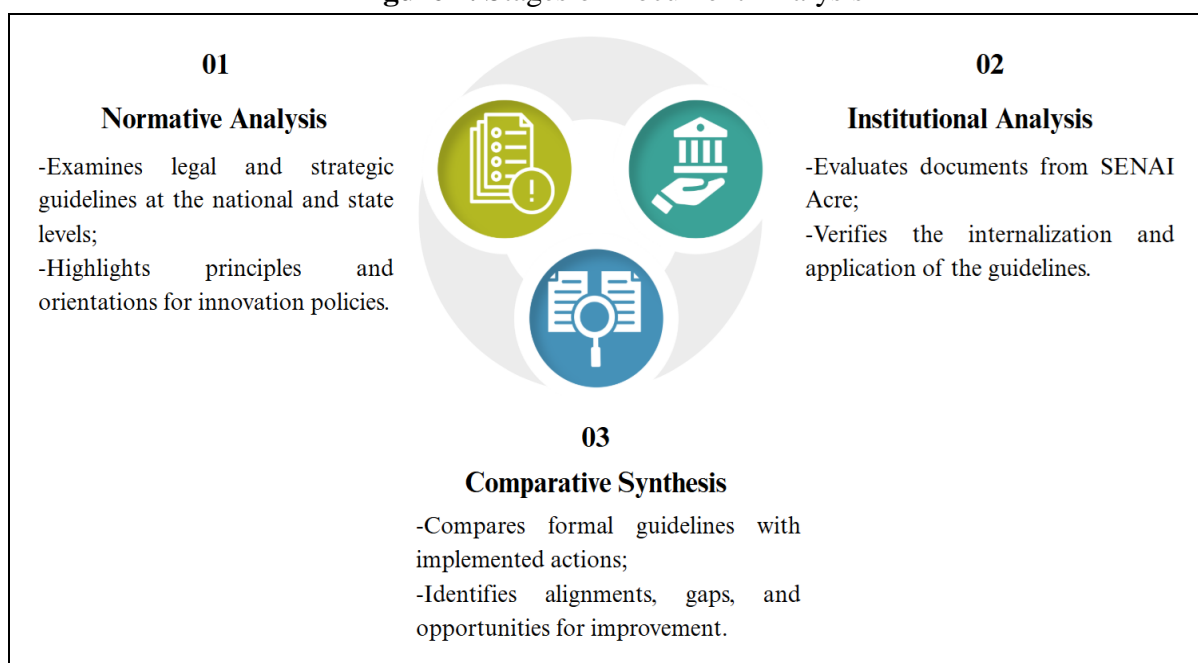
The research was based on the analysis of primary documentary sources covering various levels of regulation and strategic planning. At the national level, documents reviewed included the Legal Framework for Innovation (Law No. 10.973/2004 and its updates), the NIB Plan (2024–2026), the CNI's Strategic Map (2023–2032), and the CNI Industrial Recovery Plan. At the regional level, the analysis focused on Acre's state innovation policies and SENAI Acre's institutional documents, including its structure, organizational chart, Strategic Institutional Map, and the 2024 Management Report. These documents allowed an understanding of the institution's organization and an assessment of the evolution of the strategies adopted.

To ensure analytical coherence, the information extracted from the documents was organized into comparative matrices, classifying data according to the established criteria. Each document was examined individually and subsequently compared to others to identify correspondences and divergences between formal guidelines and implemented actions. This systematization enabled the identification of patterns, gaps, and opportunities for improvement in the application of innovation policy. The detailed examination of the relationship between public policies and their practical execution provided an in-depth diagnosis of the current stage of innovation at the institution and served as the basis for the formulation of the roadmap for the formalization of SENAI Acre's Innovation Policy.

3.1 Data Analysis and Roadmap Foundation

Data analysis was conducted through a systematic cross-referencing of information, allowing the comparison of different institutional, regulatory, and strategic documents. This approach enabled the identification of patterns, gaps, and inconsistencies, following the systematic document analysis methodology proposed by Bardin (2016). The process followed three interdependent stages, as illustrated in Figure 2.

Figure 2. Stages of Document Analysis



Source: Prepared by the authors (2025).

The first stage, normative analysis, examined national and state legal and strategic guidelines, focusing on the principles underpinning public innovation policies. The second, institutional analysis, assessed SENAI Acre documents to understand how these guidelines were incorporated into its operations. Finally, the comparative synthesis assessed the degree of alignment between formal guidelines and the actions implemented, identifying convergences, divergences, and opportunities for improvement.

Based on this systematization, a roadmap was developed to structure and guide innovation actions at SENAI Acre. It was organized into four interdependent stages—Diagnosis and Planning, Policy Structuring, Implementation and Integration, and Monitoring and Enhancement—defined according to literature on regional innovation management and public policy adaptation. The aim was to ensure continuity, strategic alignment, and responsiveness to the specificities of the local productive context.

4. Results

The document analysis showed that national innovation-oriented policies, such as the NIB Plan (2024–2026) and the CNI’s Strategic Map (2023–2032), establish broad guidelines for sustainable and competitive industrial development. However, their implementation at the regional level requires adaptations that consider local economic and productive specificities.

In the case of SENAI Acre, the 2024 Management Report highlighted the continuation of initiatives focused on innovation and strengthening the local industry. The institution advanced the construction of the SENAI Technology and Innovation Hub, designed as a strategic space to foster innovation programs, improve production processes, promote industrial digitalization, and encourage partnerships with companies, startups, and research centers.

In 2024, the regionalization of these guidelines was reflected in the expansion of technological service offerings: 20,030 hours of consulting and specialized technical services were delivered, along with 138 metrological tests and support provided to 179 companies, surpassing the target for the period by 125%. The sustainability of Technology and Innovation solutions also improved, reaching 72.2% compared to the 69.8% target, indicating greater institutional efficiency in delivering solutions aligned with regional productive demands. These results demonstrate SENAI Acre’s commitment to promoting innovation, even in the absence of a formal institutional policy to organize these actions in a continuous and integrated manner.







The NIB Plan (2024–2026), developed by the federal government, adopts a systemic and long-term approach to neo-industrialization, structured around six strategic missions: sustainable and digital agri-food chains; health industry and health economic complexes; urban well-being (mobility, housing, and sanitation); digital transformation of industry; bioeconomy, decarbonization, and energy transition; and defense, sovereignty, and security. The plan emphasizes the central role of the State in executing and monitoring actions, leveraging instruments such as subsidized credit, tax incentives, public procurement, and regulation, aiming to strengthen specific production chains and ensure technological sovereignty. The policy is described as structural, continuous, and based on inter-ministerial coordination and the establishment of clear goals for 2026 and 2033.

In contrast, the Industry Recovery Plan, prepared by the CNI (2023b), emphasizes the autonomy of the productive sector as the engine of reindustrialization. The document proposes a strategy based on improving the business environment, expanding access to financing, modernizing infrastructure, tax reform, and strengthening export instruments. Although it acknowledges the importance of public policies, the CNI plan prioritizes horizontal measures that encourage private investment in innovation and intellectual property, with less emphasis on direct state intervention in policy execution.

Both plans converge in recognizing innovation, decarbonization, and digital transformation as central axes for strengthening industrial competitiveness. However, they

diverge regarding the degree of state intervention: while the federal government advocates for a strong state role in execution and monitoring, the CNI favors strengthening the private sector and reducing the "Brazil Cost", a term referring to structural inefficiencies and bureaucratic burdens that increase the cost of doing business in the country, to create a more favorable business environment as a foundation for reindustrialization. To synthesize these convergences and divergences, Figure 3 presents a comparative analysis of the main strategic approaches.

Figure 3. Comparative analysis of innovation strategies

Aspect Analyzed	NIB Plan	CNI Strategic Map	SENAI Plan
 Strategic emphasis	Sustainability, innovation, and competitiveness	Industrial competitiveness and business autonomy	Regional technological development
 Scope of action	Centralized public management with strong state coordination	Productive sector as the main driver and reduced State intervention	Partnerships with industries and focus on professional education
 Innovation policies	Financial support, tax incentives, public procurement, and regulation	Incentives for private research and strengthening of intellectual property	Isolated initiatives without a formalized innovation policy
 Instruments used	Subsidized credit, tax incentives, public procurement policies, strategic regulation	Improvement of the business environment, incentives for private innovation, and structural reforms	Technological services, consulting, and professional training
 Alignment with local industry	Adaptable, but with strong federal centralization in decision-making	Focus on the leadership and demands of the local productive sector	Partial integration with the regional industry, lacking clear specific guidelines
 Timeframe of the strategies	Long-term planning (goals set for 2026 and 2033)	Short- and medium-term impact proposals	Short-term strategies, dependent on projects and partnerships

Source: Prepared by the authors (2025).

The figure summarizes the main differences and similarities between the NIB Plan, the CNI Strategic Map, and SENAI Acre's approach to innovation. Although the national references share the goal of strengthening reindustrialization, innovation, and sustainability, they adopt distinct strategies. The NIB Plan emphasizes the State's role in implementing and monitoring industrial policies, while the CNI Strategic Map prioritizes strengthening the autonomy and leadership of the productive sector. At the regional level, SENAI Acre still lacks structured mechanisms to consistently integrate the local private sector, highlighting the need for adjustments in the policy structuring phase.

It should be noted that other documents referenced in the methodological stage, such as the Legal Framework for Innovation and the CNI's Industrial Recovery Plan, were not included in the comparative figure, as they do not present operational strategies with structured implementation mechanisms. Instead, they served as contextual foundations that supported the development of the roadmap but did not provide directly comparable elements across the dimensions analyzed in the figure.

The analysis showed that although SENAI Acre carries out innovation initiatives through business partnerships and the promotion of professional education, these actions are decentralized and unsystematic. Unlike national plans, which define clear guidelines and monitoring mechanisms, SENAI Acre's actions show weaknesses in alignment with national strategies and the specific demands of the regional productive sector.

This scenario reinforces the need for more structured planning, capable of organizing and strengthening innovation initiatives, promoting greater coherence between institutional actions and national guidelines. To address this need, a roadmap is proposed for the formalization of SENAI Acre's Innovation Policy, structured into stages comprising the diagnosis of existing initiatives, strategy definition, implementation of actions, and the creation of continuous monitoring and improvement mechanisms. The following section presents the guidelines of this proposal.

4.1 Roadmap Proposal for the Formalization of the SENAI Acre Innovation Policy

Based on the challenges identified in the document analysis, such as the absence of a structured innovation policy, the decentralization of initiatives, and the lack of continuous monitoring mechanisms, a roadmap was developed for the formalization of the SENAI Acre Innovation Policy. Its structure was based on the guiding principles of the NIB Plan (2024–2026) and the CNI's Strategic Map (2023–2032), adapted to the specific needs identified in the regional context. The roadmap seeks to align SENAI Acre's actions with national innovation and technological development efforts, organizing initiatives in a systematic and sustainable manner.

The roadmap's construction followed a logic directly derived from the document analysis, in which observed gaps in strategic alignment, action systematization, and articulation with the productive sector guided the definition of the stages and implementation mechanisms. To make the process more objective and aligned with the identified demands, each stage was designed as a direct response to these gaps.

The absence of a systematized diagnosis justified the need for an initial phase focused on mapping existing initiatives and assessing installed capacities. The lack of formal guidelines and governance mechanisms indicated the creation of a specific phase for policy structuring, with the definition of strategic objectives and guiding principles. The decentralization of actions led to the organization of a phase for implementation and integration, aiming to



consolidate partnerships and modernize productive processes. Finally, the absence of continuous evaluation systems justified the inclusion of a monitoring and improvement phase, allowing for strategic adjustments and the ongoing updating of initiatives.

Instead of adopting a generic model, a flexible structure was chosen, capable of adapting to changes in the industrial sector and updates to national guidelines. The innovation policy was conceived as a continuous process, involving everything from the diagnosis of the current scenario to the definition of monitoring and review mechanisms. For this purpose, the roadmap was organized into four interdependent stages, each with specific functions in the implementation process.

The first stage, Diagnosis and Planning, consists of mapping the existing innovation initiatives, evaluating ongoing programs, installed capacities, and the impacts of previously developed actions. In addition, the specific needs of Acre's industrial sector are analyzed, allowing national guidelines to be adapted to the regional reality and identifying opportunities for optimized application.

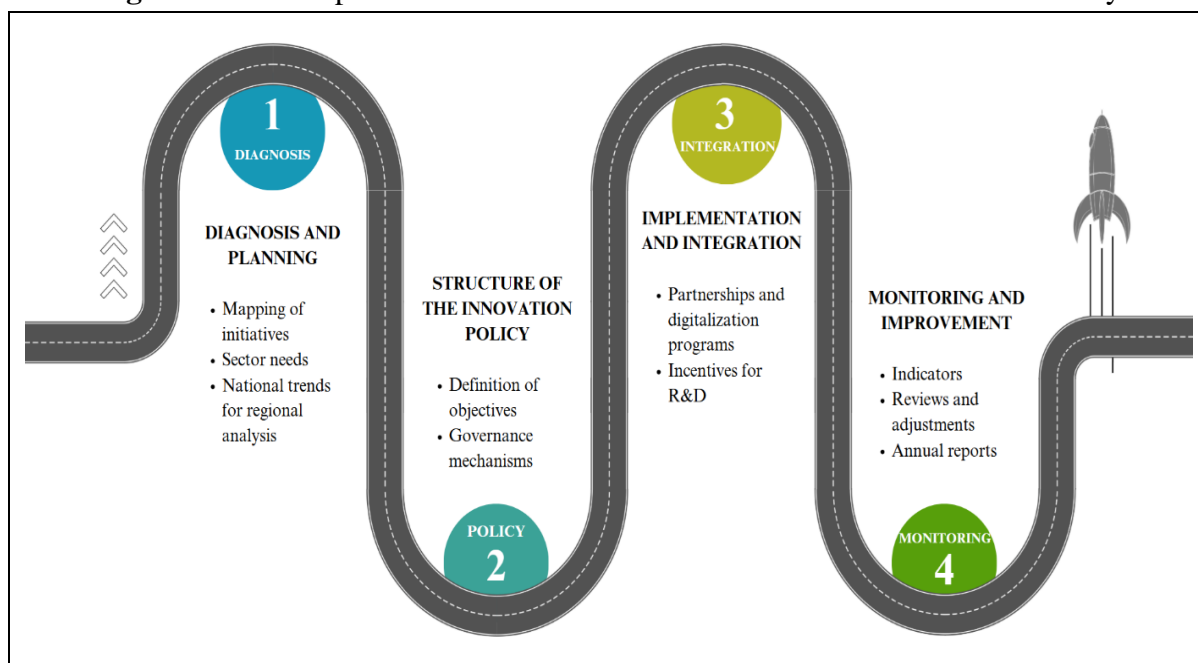
Based on the findings of this analysis, the Policy Structuring phase begins, in which strategic objectives are defined, ensuring alignment with the NIB Plan and the guidelines established by SENAI Nacional and CNI. In addition to formulating guiding principles, this stage includes the creation of governance and monitoring mechanisms, ensuring that the policy continues and can be reviewed as necessary to meet local industry demands.

Following the structuring phase is the Implementation and Integration stage, where the defined strategies begin to be applied. This phase includes consolidating partnerships with companies and academic institutions to drive innovation projects, as well as creating programs aimed at digitizing production processes and modernizing technological education. The goal is to strengthen the alignment between professional training and industrial innovation, and to encourage the adoption of new technologies and intellectual property in the productive sector.

Finally, the Monitoring and Improvement stage establishes a continuous evaluation system, in which performance indicators are defined to measure the impacts generated by the innovation policy. This ongoing monitoring enables strategic adjustments as needed, ensuring that implemented initiatives remain aligned with industrial transformations and national innovation policy updates.

Figure 4 below illustrates the roadmap.

Figure 4. Roadmap for the Formalization of the SENAI Acre Innovation Policy



Source: Prepared by the authors (2025).

The figure outlines the proposed stages, showing how each phase contributes to the consolidation of SENAI Acre’s Innovation Policy. The roadmap was developed with flexibility and adaptability, allowing adjustments in response to new productive demands, technological advances, and changes in national guidelines. Rather than a rigid model, its structure enables continuous revision, ensuring the policy evolves in step with the industrial sector and public innovation policies.

This approach is essential in a dynamic industrial innovation context, where factors such as new technologies, changes in production chains, and shifts in government policies directly impact sector competitiveness. The roadmap’s flexible structure allows SENAI Acre to adjust its strategies, whether to incorporate new technological solutions, strengthen partnerships, or access incentives available through the NIB Plan.

In addition to consolidating the institution’s innovation actions, the roadmap contributes to more effective integration between SENAI Acre, national reindustrialization policies, and the needs of the local productive sector. This alignment supports coordination among innovation actors, fostering a more conducive environment for technological development and strengthening the regional industry.

With this dynamic and adaptable structure, SENAI Acre assumes a strategic role within the national movement for industrial modernization, ensuring that its actions align with the innovation and competitiveness goals defined at the federal level. The following section

discusses the impacts of this proposal and the implications of adapting national guidelines to the regional context.

5. Discussion

The analysis of the results underscores the relevance of a regionalized approach to industrial innovation, highlighting that the adaptation of national policies to local specificities is a determining factor for their success. The absence of a formalized innovation policy at SENAI Acre reveals a weakness in the institution's relationship with the "government" component of the Triple Helix Model, as it faces difficulties in mediating local demands with national guidelines and in establishing more effective partnerships with state and municipal governments.

The experience of various Brazilian states demonstrates that the formalization of structured policies significantly contributes to increasing the predictability of institutional actions, facilitating investment attraction, and strengthening the integration between industry, government, and academic institutions (Crippa & Souza, 2019; Lago et al., 2025; Santos et al., 2023). In Acre, this movement recently materialized with the approval of State Law No. 4.132/2023 (Acre, 2023), which establishes the state policy for promoting innovation and scientific and technological development. The law advances by establishing cooperation between the government, the productive sector, and academic institutions as a guiding principle (Art. 2); creating financial support instruments for research and innovation activities (Art. 4); and promoting intellectual property as a strategic element for regional development. The creation of the State Council for Innovation, Science, and Technology (Art. 5) reinforces the commitment to shared governance, which is essential for consolidating a dynamic innovation ecosystem aligned with national directives.

International studies complement this perspective by showing that the decentralization of innovation policies favors the adaptation of national guidelines to regional realities, allowing local productive sectors to develop solutions that are more aligned with their specific needs (Beaudry et al., 2021; Morisson & Doussineau, 2019; Song & Zhao, 2024). In this regard, Li et al. (2020) analyze the Chinese experience and show that decentralization, by allowing more developed regions, such as southern Jiangsu, to craft specific local policies, resulted in greater efficiency in the use of innovation resources and in the generation of knowledge and economic outcomes. The study also highlights that although China's central government establishes general guidelines, local adaptation capacity is key to promoting regional development and reducing inequalities, reinforcing the importance of a decentralized approach in formulating and implementing innovation policies.

The documentary analysis, especially of the 2024 SENAI Acre Management Report (SENAI, 2025), showed that although the institution has expanded its role in applied research, technological services, and professional training in partnership with several public entities, it

still lacks a formalized innovation policy. The current approach is marked by relevant initiatives such as specialized consulting, interinstitutional partnerships, and the implementation of technical courses, but lacks strategic direction to ensure continuity and articulation among ecosystem actors. In this context, adopting a structured innovation plan could enhance the predictability of actions, strengthen collaboration with businesses and academic institutions, and consolidate SENAI Acre as a strategic agent in regional technological development.

The experience of other SENAI regional departments reinforces this need. Santos et al. (2021) point out that units with structures focused on intellectual property and technology transfer, such as those in São Paulo and Bahia, show better performance in patent filings and innovative projects. This performance is linked to the existence of formal institutional policies, specialized teams, and documented processes.

Additionally, Munaretti et al. (2025), through a study on Federal Institutes in Brazil's Northern Region, show that even in contexts with lower institutional maturity, the formalization of innovation policies focused on intellectual property and technology transfer contributes to increasing regional competitiveness and strengthening engagement with the productive sector.

The formalization of such directives not only organizes internal actions but also facilitates the dissemination of best practices among regions, serving as a benchmarking model for less structured departments. Benchmarking, understood as the process of identifying, comparing, and adapting successful practices, is a relevant tool for strengthening regional innovation ecosystems.

This pattern confirms the central premise of this study: formalizing an Innovation Policy at SENAI Acre will not only organize existing actions but also create the conditions to replicate successful experiences observed in other regions. The roadmap structure proposed, with stages dedicated to governance and monitoring, seeks to address the gap identified by Santos et al. (2021) in departments lacking clear directives, where isolated initiatives tend to lose effectiveness due to lack of continuity.

Furthermore, Coletto et al. (2024), Myllyoja et al. (2022) and Silva et al. (2025) emphasize that efficient innovation ecosystems are characterized by strategic planning and integration among diverse actors within the productive sector. In the Brazilian context, the NIB Plan (2024–2026) establishes broad guidelines for reindustrialization with a focus on innovation and sustainability. However, its effectiveness depends on the ability of states and local institutions to translate these guidelines into concrete actions adapted to their specific realities.

In this scenario, the proposed roadmap for SENAI Acre plays an essential role, as it not only systematizes the initiatives already underway but also guides the structuring of an Innovation Policy aligned with national guidelines and the specific needs of Acre's industrial



sector. Its flexible structure allows for continuous adjustments in response to new productive demands, technological advances, and changes in national directives, thereby increasing the resilience of the institution's actions.

This analysis is supported by the documentary evaluation, which revealed the current fragmentation of innovation initiatives in the state, and by literature on structured innovation policies, which shows the correlation between continuous planning and the strengthening of productive ecosystems. Thus, the roadmap contributes to building a more competitive and innovative business environment, reinforcing SENAI Acre's role as a strategic driver of the state's industrial development.

Based on these findings, the formalization of an innovation policy for SENAI Acre represents a significant step toward structuring the regional industrial ecosystem, ensuring greater alignment between local efforts and national policies. By integrating strategic planning, institutional partnerships, and monitoring mechanisms, the roadmap supports the implementation of more effective and sustainable actions, ensuring that innovation becomes a central pillar in the modernization of Acre's industry.

6. Conclusion

This article demonstrated that the absence of a structured innovation policy at SENAI Acre undermines the integration of its initiatives with national guidelines and the specific demands of the regional productive sector. The document analysis revealed that, despite the existence of isolated innovation-oriented actions, the lack of strategic direction limits the effectiveness and sustainability of the projects developed.

To address this gap, a roadmap was proposed, organized into four stages—Diagnosis and Planning, Policy Structuring, Implementation and Integration, and Monitoring and Improvement—conceived as a dynamic instrument for planning and execution. The model aims to ensure greater predictability, impact, and continuity of innovation efforts, promoting alignment between institutional action and national guidelines, adapted to local specificities.

The analysis also revealed a direct relationship between maturity in intellectual property management and the presence of formalized institutional policies. SENAI departments with structured guidelines, such as those in São Paulo and Bahia, show higher productivity in technological innovation, serving as benchmarks for the development of regions with emerging ecosystems. In this sense, implementing the roadmap in Acre could foster a virtuous cycle of innovation, driving regional technological and industrial development.

The literature reviewed reinforces that innovation policies adapted to local realities are essential for strengthening industrial competitiveness. The experiences of other Brazilian states and international contexts demonstrates that decentralization and regionalized governance enhance the ability to attract investments and promote greater coordination among industry, government, and academic institutions.



The roadmap proposed in this study aligns with this perspective by providing a flexible planning structure, capable of adapting to new productive demands, technological advances, and updates to national policies. Its application strengthens SENAI Acre as a strategic agent in modernizing the regional industry and contributes to the state's integration into national reindustrialization and innovation strategies.

As a follow-up, it is recommended that future research evaluate the practical implementation of the proposed roadmap, analyzing its impacts on strengthening Acre's innovation ecosystem. In parallel, comparative studies across different Brazilian states with varying levels of institutional maturity could help identify critical success factors in the regionalization of innovation policies.

Thus, this study not only proposes a strategic tool for industrial modernization in Acre but also offers valuable insights for improving Brazil's industrial policy, reaffirming the importance of regionalization as a key driver for strengthening national innovation.

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