Education, Technology, Infrastructure: Comparative Analysis between the Indicators in Company A's Results Report and the Competitive Brazil Movement

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Abstract: This article aimed to conduct a comparative analysis between the operational indicators extracted from the performance report of Company A — a state-owned company responsible for the distribution logistics of objects in Brazil — with an emphasis on the Object Distribution Center, located in Salvador, state of Bahia, and the strategic pillars of the Competitive Brazil Movement. The methodology applied was based on exploratory analysis of documents and the use of descriptive and visual techniques for interpretation, focusing on the pillars of education, technology, and infrastructure. The results allowed us to identify patterns, correlations, and gaps between Company A's internal performance and the standards of excellence desired by Competitive Brazil for the period of 2015 to 2024. It was noted that, while data from Competitive Brazil showed an average increase of 12% in national indices related to education, 18% in technology, and 9% in infrastructure, Company A's internal indicators for the same period recorded significantly lower variations—5%, 7%, and 3%, respectively. These results reinforce the magnitude of the strategic gaps and highlight flaws in professional training policies, digital transformation processes, and the modernization of logistics infrastructure. This article proposes practical guidelines for requalifying Company A, anchored in a systemic and sustainable vision of public management. The proposal seeks to contribute to the debate on the need for convergence between strategic planning, digitization, and public policies geared toward logistical efficiency.

Keywords: Comparative analysis, Competitiveness, Logistics, Education, Technology, Infrastructure.

1. Introduction

The competitiveness of an organization or country is directly linked to its ability to strategically invest in three key areas: education, technology, and infrastructure. These elements form the basis for sustainable economic growth, institutional innovation, operational efficiency, and productive integration into an increasingly dynamic, digital, and data-driven global market. In this context, logistics — in both public and private companies — plays a central role, as the efficiency of services directly impacts the population, the productive sector, and national integration.

Company A, a public institution responsible for the logistics of distributing objects in Brazil, has undergone profound changes in its operating model. Advances in technology, the exponential growth of e-commerce, and pressure for more agile and responsive services reinforce the need to align its practices with standards of excellence in competitiveness. This implies continuous investment in professional training, technological innovation, and modernization of physical and digital infrastructure — dimensions that reflect the organization's commitment to improving performance and modernizing the state.

The Competitive Brazil Movement (CBM) [1] , articulated by entities such as the National

Confederation of Industry (NCI) and the World Economic Forum, offers a comprehensive set of indicators that measure Brazil's position relative to other global economies, covering, among other areas, education, technology, and logistics infrastructure. The comparison between these parameters and Company A's internal indicators made it possible to assess the convergence between institutional actions and national objectives to increase productivity and the country's competitive insertion.

This study analyzed data from Company A's Results Report (CARR) [1], with an emphasis on the Object Distribution Center (ODC), located in Salvador/BA, comparing them with CBM indicators between 2015 and 2024. The three pillars selected — education, technology, and infrastructure — reflect critical areas for strengthening state logistics in Brazil and were defined by their strategic relevance in the current scenario.

By proposing an integrated methodology to compare institutional operational data with international benchmarks, this article provides a replicable model for institutional analysis against national competitiveness indicators. This framework made it possible to identify gaps and misalignments, guide institutional requalification actions, and provide input for public policies and business strategies aimed at digital transformation, professional training, and modernization of logistics infrastructure.

2. Theoretical Framework

2.1 Education, Technology, and Infrastructure as Pillars of Competitiveness

The integration of education, technology, and infrastructure is widely recognized as a necessary condition for strengthening a nation's competitiveness. According to [3], the ability to innovate and adapt quickly to market changes depends on an environment supported by efficient institutions, modern infrastructure, qualified education, and technological capacity.

In the field of education, authors such as [4] argue that skilled human capital are crucial for long-term growth. In the logistics sector, the technical and operational training of workers has a significant influence on productivity and service quality. In Brazil, the lack of specialized technical training is still an obstacle to the modernization of public companies such as Company A [5].

In terms of technology, digital transformation has been identified as a key driver of logistical efficiency and increased organizational competitiveness. According to [6], the Fourth Industrial Revolution requires the digitization of processes and the integration of technologies such as the Internet of Things (IoT), big data, and artificial intelligence. In the public sector, the adoption of these technologies is essential to

make services more agile, responsive, and data-driven. [7].

With regard to infrastructure, recent studies show that the structure, availability, and quality of the logistics network have a direct impact on transportation costs, delivery times, and consumer confidence [8]. In Brazil, the historical deficit in urban and transport infrastructure represents a significant barrier to competitiveness. [9]. In this context, the modernization of distribution centers, such as Company A's ODC, should consider the integration of physical (layout, equipment) and digital (intelligent routing, traceability) solutions.

The articulation between these three pillars — education, technology, and infrastructure — enhances systemic and sustainable gains. Research indicates that countries with solid educational systems, a high degree of digitization, and modern infrastructure have better competitiveness and development indices. [10], [11]. In the case of Company A, aligning these elements is essential to increase the efficiency, sustainability, and reliability of the services provided to the population.

3. Methodology

The research adopted a qualitative and quantitative approach, with an exploratory-descriptive character, aiming to analyze the adherence between the institutional indicators of Company A's Results Report (CARR) and the national strategic parameters established by the Competitive Brazil Movement (CBM), focusing on the pillars of education, technology, and infrastructure, from 2015 to 2024.

The data was selected based on availability, institutional reliability, and relevance to the three pillars analyzed. Focusing on information that was published annually and was methodologically consistent, direct comparisons with the CBM indices for the same time period were allowed.

The analysis was conducted using interactive panels created in Microsoft Power BI®, structured in dashboards that enabled visual comparison of variables, periods, and scenarios. According to [12] e [13], this approach meets the demand for visual, agile, and data-driven analysis methods in the context of public management.

Descriptive statistical techniques and correlation analysis between internal and national indicators were applied to identify performance patterns and the magnitude of differences. The results were presented in thematic graphs (columns and rows), facilitating the interpretation and communication of the findings.

The study complied with the principles of the General Data Protection Law (GDPL – Law 13.709/2018), using only institutional data that is public or has been previously authorized for academic purposes, without any use of sensitive individualized information.

4. Results and discussions

The data allowed for a deeper understanding of Company A's internal performance and its relationship with the strategic pillars of national competitiveness. The results presented below are organized by correlated themes and aligned with the axes of education, technology, and infrastructure.

4.1 Education and Professional Training: Correlation between CARR and CBM Ranking

In the Education axis, there was a direct correlation between the variation in investments in professional training by Company A and Brazil's position in the CBM ranking. Between 2015 and 2024, the country fell from 9th to 18th place, following significant fluctuations in Company A's internal metrics.

In 2020, the best performance of the period was observed, with 10.47 million hours of training and an annual average of 130.4 hours per employee — an increase of 349% compared to 2019. This result was driven by remote learning during the COVID-19 pandemic, which expanded the use of online learning platforms. However, there was a decline in subsequent years: in 2023, the total number of hours fell by 52.5% compared to 2020, reaching 4.97 million hours, while the average per employee fell by 54.7%, reaching 59.4 hours. Figures 1 and 2 graphically illustrate this trend.

Figure 1. Evolution of training hours at Company A (annual) and Brazil's position in the CBM Education pillar

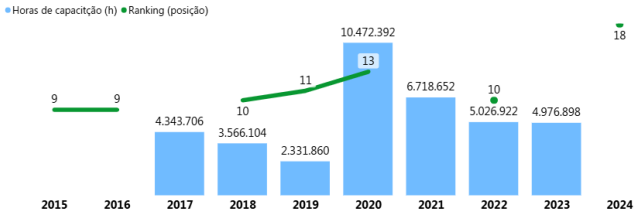
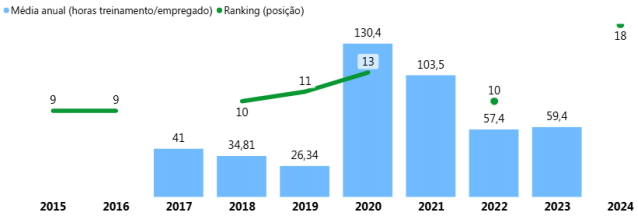
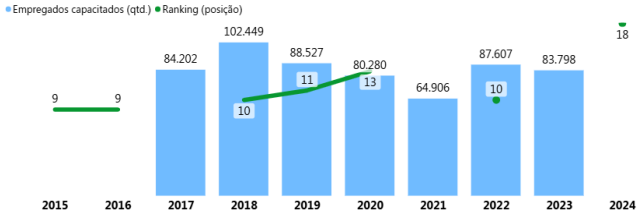


Figure 2. Evolution of average training hours per employee at Company A (annual) and Brazil's position in the CBM Education pillar



As for the number of trained employees, there was a 23.6% reduction between the peak of 102,449 in 2018 and the lowest figure for the period, 78,798 in 2024 (Figure 3). Despite a slight recovery in 2022 and 2023, this evolution did not prevent Brazil from falling in the ranking, showing that the quality and consistency of training are as important as the volume offered.

Figure 3. Evolution of the number of trained employees at Company A (annual) and Brazil's position in the CBM Education pillar

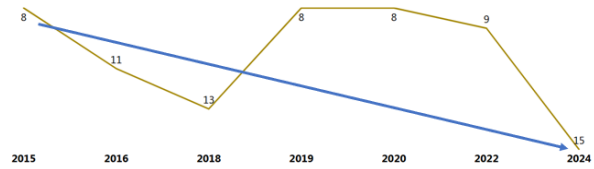


This trajectory reinforces the urgency of institutional policies focused on continuous corporate education, prioritizing the development of technical and digital skills compatible with current logistical challenges. It is necessary to avoid the trap of measuring performance solely by hours/class, ensuring that the investment translates into effective gains in productivity and competitiveness.

4.2 Innovation and Technology: Mismatch between National Strategy and Organizational Practice

The analysis of the Innovation and Technology pillar confirms that competitiveness requires not only structural investments, but also their continuity and strategic alignment. As shown in Figure 4, between 2015 and 2024, Brazil fell from 8th to 15th place in the CBM ranking, representing a relative loss of 87.5% in its initial position. The sharpest decline occurred between 2022 and 2024, when the country fell from 9th to 15th place, reflecting a weakening of public policies to encourage science, technology, and innovation.

Figure 4. Evolution of Brazil's position in the Innovation and Technology pillar of the CBM



In the case of Company A, a gap was identified between specific advances in digital transformation and the consolidation of an innovation-oriented organizational culture. Despite the adoption of initiatives such as routing systems, logistics simulations, and interactive dashboards developed in Microsoft Power BI®, such actions have not yet resulted in significant gains in performance indicators due to the lack of integration with a long-term strategic plan.

This disconnect stems from factors such as the lack of a consistent corporate strategy, high turnover in strategic positions, and insufficient digital training for the workforce. The reduction in investments in technological training, as evidenced in the Education section (section 4.1), reinforces this stagnation.

In addition, the lack of mechanisms to encourage open innovation, partnerships with research centers, and integration with startups widens the gap between the company and practices adopted by public logistics organizations in more competitive countries [5], [10].

According to [14], innovation is not limited to the adoption of emerging technologies, but includes process management, new operating models, and the ability to learn from the external environment. Without institutional structures to support this dynamic, results tend to be sporadic and unsustainable.

The performance of Brazil and Company A in this pillar reveals that local organizational decisions can amplify national weaknesses, limiting the company's potential contribution to sectoral and national competitiveness.

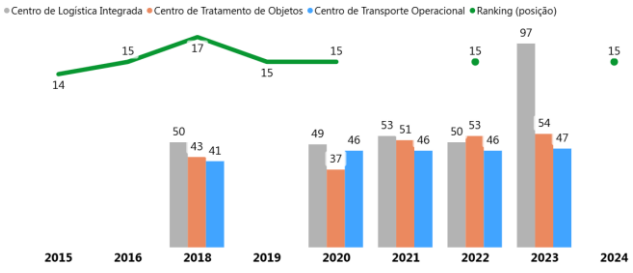
4.3 Logistics Infrastructure and Operational Efficiency: Intersections between CARR and the Competitiveness Ranking

According to the CBM, infrastructure is one of the key factors in boosting competitiveness, especially in countries with large territories such as Brazil. In the logistics sector, it encompasses not only physical coverage and installed capacity, but also technological integration, operational flow, and efficient use of resources.

Company A has extensive operational reach, with 945 Distribution Centers (ODC) and approximately 6,000 branches, serving 99.75% of Brazilian municipalities. This reach reinforces its role as a vector of national integration. However, when compared to the CBM ranking, it can be seen that between 2020 and 2024, Brazil remained in 15th place in the Logistics Infrastructure factor, with no relative gains — which shows that mere physical availability has not translated into effective performance improvements (Figure 5).

Despite the robustness of the network, the analysis indicates that the lack of continuous modernization and digital integration in the units prevents the potential from translating into a competitive advantage. Between 2022 and 2023, there was a decrease from 45 to 43 units in the Integrated Logistics Center (-4.4%) and an increase from 51 to 54 in the Object Treatment Center (+5.9%), but these variations did not have a positive impact on the ranking.

Figure 5. Evolution of Company A's operational network and Brazil's position in the Logistics Infrastructure pillar of the CBM



For [6] e [9], Brazil's logistics deficit, characterized by bottlenecks in urban networks, highways, and distribution centers, compromises both private and public companies. The integration of physical infrastructure with digital solutions — such as intelligent routing, automated delivery management, and computer simulation — is strategic for increasing operational efficiency.

The use of tools such as Microsoft Power BI® and digitization of plans in AutoCAD has allowed greater visibility into indicators and space usage, resulting in gains at the tactical management level. However, these advances are sporadic and require support through permanent institutional policies for structural requalification.

The analysis of average activity execution times revealed that units with optimized layout and ergonomic standardization showed an increase in delivery time and a decrease in internal work time, confirming the direct relationship between infrastructure and operational efficiency [15].
The results indicate that, although there are isolated initiatives for modernization and digitization, the absence of a national and integrated plan for continuous investment limits the sustainability of improvements. A retraining program that combines physical redesign, operator training, and management based on indicators aligned with the national competitiveness strategy is essential to transform Company A's logistics infrastructure into a high-impact strategic asset.

Taken together, the analyses of the Education, Innovation and Technology, and Logistics Infrastructure axes show that Company A's performance, although showing occasional advances, still lacks strategic alignment and consistency in institutional policies for its potential to translate into sustainable gains in competitiveness. By identifying gaps and proposing practical guidelines, it offers a replicable analysis model that can guide public and private organizations in increasing their efficiency and effectively contributing to national competitiveness.

5. Conclusion

A comparative analysis between data from Company A's Results Report (CARR) and indicators from the Competitive Brazil Movement (CBM) revealed a strategic misalignment between the organization's operational performance and the national pillars of competitiveness—education, technology, and infrastructure. Although specific advances have been identified in training, use of digital tools, and localized physical improvements, these actions remain fragmented, without consistent integration or alignment with national development goals.

In the education pillar, there was a strong correlation between investment in training and Brazil's position in the CBM ranking. The peak recorded in 2020, driven by the pandemic and the adoption of distance learning, led to a significant increase in training hours. However, the subsequent decline, both in total hours and in the average per employee, exposed the absence of a continuous and structured human development program. It is recommended that a permanent corporate education policy be institutionalized, focused on technical, digital, and managerial skills, aligned with the demands of contemporary logistics.

As for technology, progress was limited to isolated initiatives, such as the use of Microsoft Power BI® and layout modeling in AutoCAD, without any systemic digital transformation. Brazil's drop to 15th place in the innovation and technology ranking highlights the need to expand digitization and incorporate solutions such as automation, artificial intelligence applied to routing, and real-time monitoring of key indicators. To this end, it is essential to consolidate an integrated logistics platform that strategically connects operations, data, and management.

In terms of infrastructure, the analysis identified an extensive physical network with broad territorial coverage, but with structural and operational bottlenecks that reduce efficiency. Significant differences in average execution times between locations indicate problems with sizing, planning, and technological integration. The modernization of logistics assets should be guided by industrial engineering criteria, sustainability, and intelligent use of space, accompanied by continuous investments and productivity indicators.

The results reinforce that the competitiveness of an institution such as Company A—which is nationally significant—cannot be sustained by isolated actions, but rather by coordinated long-term policies that combine continuous corporate education, digitization, and infrastructure modernization.

This study contributes to advancing discussions on the modernization of essential public services by proposing an analysis model that can be replicated by other state organizations. By highlighting the relationship between internal indicators and strategic pillars of competitiveness, it reinforces the importance of public management guided by results, innovation, and social responsibility, capable of transforming institutional potential into a competitive advantage for the country.

References

[1] COMPETITIVE BRAZIL MOVEMENT. National Competitiveness Indicators 2015–2023. Brasília: CBM, 2023.
[2] CARR - COMPANY RESULTS REPORT A. Indicators. 2017–2023.
[3] PORTER, Michael E. The Competitive Advantage of Nations. New York: Free Press, 1990.
[4] HANUSHEK, Eric A.; WOESSMANN, Ludger. The Knowledge Capital of Nations: Education and the Economics of Growth. Cambridge, MA: MIT Press, 2015.
[5] OECD – ORGANIZATION FOR ECONOMIC COOPERATION AND DEVELOPMENT. Education at a Glance 2022: OECD Indicators. Brasília: OECD, 2022. Available at: https://www.oecd.org. Acess in: 12 jul. 2025.
[6] SCHWAB, Klaus. The Fourth Industrial Revolution. Geneva: World Economic Forum, 2016.
[7] MORRAR, Rami; ARMAN, Hani; MOUSA, Samar. The Fourth Industrial Revolution (Industry 4.0): A Social Innovation Perspective. Technology Innovation Management Review, Ottawa, v. 7, n. 11, p. 12–20, 2017. DOI: https://doi.org/10.22215/timreview/1117.
[8] WORLD ECONOMIC FORUM. The Global Competitiveness Report 2023. Geneva: WEF, 2023. Available at: https://www.weforum.org. Acess in: 18 jul. 2025.
[9] IPER – INSTITUTE OF APPLIED ECONOMIC RESEARCH. Transportation infrastructure in Brazil: Diagnosis and challenges. Brasília: IPER, 2022. Disponível em: https://www.ipea.gov.br. Acess in: 14 jul. 2025.
[10] IMD – INTERNATIONAL INSTITUTE FOR MANAGEMENT DEVELOPMENT. World Competitiveness Ranking 2023. Lausanne, 2023. Available at: https://www.imd.org/wcc. Acess in: 15 jul. 2025.

[11] WORLD BANK. World Development Report 2021: Data for Better Lives. Washington: World Bank, 2021. Disponível em: https://www.worldbank.org. Acess in: 20 jul. 2025.
[12] TORFING, J.; ANDERSEN, L. B.; GREVE, C.; KLAUSEN, K. K. Public Governance as Co-Creation: A Strategy for Revitalizing the Public Sector and Rejuvenating Democracy. Cambridge: Cambridge University Press, 2022.
[13] COSTA, L. F.; ANDRADE, R. M. Interactive dashboards and data-driven public management: trends and challenges in contemporary administration. Brazilian Journal of Public Administration, Rio de Janeiro, v. 57, n. 2, p. 233–252, 2023.
[14] TIDD, J.; BESSANT, J. Managing Innovation: Integrating Technological, Market and Organizational Change. 5. ed. Chichester: John Wiley & Sons, 2015
[15] RODRIGUES, Carlos A.; SILVA, Mariana B. Public management and innovation: challenges of competitiveness in the logistics sector. São Paulo: Atlas, 2020.