Management of Technological and Organizational Innovation as a Strategic Vector for Building Competitive Advantages: Case Study of Macon Transportes (2020–2024)

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ABSTRACT

In the current global context, technological and organizational innovation is essential for building and maintaining sustainable competitive advantages in organizations (Tidd & Bessant, 2021). This study analyzes the role of innovation management as a strategic instrument in the performance of Macon Transportes, from 2020 to 2024, in a scenario marked by technological transformations, regulatory changes, and growing consumer demands. The research uses a mixed approach, combining quantitative and qualitative analysis, to understand how the integration of technological solutions and organizational reconfiguration contributed to operational efficiency, customer satisfaction, and market expansion (OECD, 2018; Porter, 1990). To achieve the objectives, it was possible with the help of documentary, descriptive and exploratory techniques, which allowed us to collect data through a questionnaire projected on the digital platform (Google Form) directed in person and via link, analyzed by the tool (Power BI) and statistical software (SPSS), in order to best determine the results of the research. Preliminary results indicate that Macon Transportes adopted incremental and disruptive innovation practices, namely the implementation of digital fleet management systems, online ticketing platforms, and logistics improvements, which reduced operating costs and increased service predictability (Schumpeter, 1934; Christensen, 1997). Furthermore, organizational changes, based on greater structural flexibility and human resource development, proved crucial for adapting to market dynamics and differentiating itself from the competition (Drucker, 2002). It is concluded that the integrated management of technological and organizational innovation, when guided by a clear strategy aligned with corporate objectives, is a decisive element in strengthening the competitive position of transportation companies in the Angolan and regional context. These results suggest that continuous innovation policies should be prioritized as pillars of business development and sustainability (Barbosa et al., 2020).

Keywords: Technological innovation, organizational innovation, competitive advantage, Macon Transportes, strategic management.

INTRODUCTION

The 21st century is characterized by rapid and profound transformations in the way organizations compete, innovate, and position themselves in the market. Regardless of sector or size, companies face the need to respond quickly to technological changes, market fluctuations, and increasingly sophisticated consumer demands (Tidd & Bessant, 2020). In the transportation sector, these challenges take on particular relevance: it is imperative to ensure efficient, safe, and reliable mobility, while incorporating innovative solutions to reduce costs, improve service quality, and strengthen environmental sustainability (Rodrigues, 2019). In this scenario, managing technological and organizational innovation emerges as a strategic vector for generating sustainable competitive advantages.

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More than simply acquiring new technologies, it is about integrating them harmoniously into the organization's culture and structure, promoting process changes and enhancing value creation for customers, employees, and society (OECD, 2018). Innovation, understood in this way, ceases to be a one-off or reactive event and becomes a continuous, planned process aligned with a long-term strategy. MACON Transports, a leader in road passenger and freight transportation in Angola, has built a solid reputation over the years based on regularity, territorial coverage, and the quality of its services. Between 2020 and 2024, its operational environment was marked by challenges and opportunities: advances in digitalization, the growing use of telemetry for fleet management, the need to optimize internal processes, increased competition, the impacts of the COVID-19 pandemic, and customers with higher expectations regarding the transportation experience.

Given this scenario, it is important to understand how MACON managed technological and organizational innovation, what resources and capabilities it mobilized, and how these initiatives contributed to building and sustaining competitive advantages. More than a technical analysis, this study seeks to explore the interaction between technology, processes, people, and strategy, recognizing that intangible assets, such as a culture of innovation, organizational learning, and adaptability, play as important a role as tangible assets (Barney, 1991). From an academic perspective, this research lies at the intersection of innovation management, strategy, and competitive performance, a field increasingly studied due to its direct impact on corporate sustainability (Dodgson et al., 2014). From a practical perspective, it aims to provide MACON and other companies in the sector with diagnostic tools and evidence-based improvement proposals. The 2020–2024 timeframe is particularly relevant, not only because of the impact of the pandemic and the acceleration of digital transformation, but also because of the reinforced importance of customer experience and the need for more agile and intelligent operating models (Christensen, 2016). Thus, this research is based on the premise that technological innovation, when aligned with organizational innovation and a clear value creation strategy, can constitute a powerful instrument for ensuring long-term competitiveness.

Relevance and Problem Formulation

Technological innovation alone does not guarantee a sustainable competitive advantage. Companies can invest in sophisticated management systems, modern fleets, and digital tools, but if such investments are not accompanied by coherent organizational changes in culture, processes, staff training, and management structure, their impact tends to be limited (Porter, 1996; Tidd & Bessant, 2020). From 2020 to 2024, MACON Transportes adopted a set of innovative initiatives that combined technological improvements with organizational changes. However, it remains unclear to what extent these actions were integrated into a coherent value creation strategy and how they influenced the company's operational performance, customer satisfaction, and competitive positioning. The central question guiding this study is: How did the management of technological and organizational innovation contribute to building and sustaining competitive advantages at MACON Transportes between 2020 and 2024? This question leads to further questions, such as:

- What were the main technological and organizational innovations implemented?
- What internal and external factors facilitated or hindered their adoption and integration?
- Was there alignment between technology investments and changes in organizational culture and processes?
- What measurable impact did these initiatives have on the company's performance and perceived competitiveness?

The formulation of this problem stems from the recognition that competitive advantage results from a set of resources and capabilities that are unique, difficult to imitate, and continually renewed. Therefore, the research seeks not only to describe what was done, but to understand how it was done, why it worked (or didn't work), and what can be improved, offering a real contribution to MACON's future strategy and that of other companies in the sector.

Research Objective

This study aims to analyze, in an integrated manner, the management of technological and organizational innovation at MACON Transportes, seeking to understand how these dimensions, when strategically articulated,

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can contribute to the creation and maintenance of sustainable competitive advantages in road transportation in Angola. At the technological level, the research examines the solutions adopted by the company between 2020 and 2024, such as telemetry-based fleet management systems, digitalization of administrative and operational processes, electronic ticketing platforms, real-time tracking, and other decision-making tools. The analysis is not limited to the technical sophistication of these solutions, but primarily considers how they were implemented and integrated to generate value (Tidd & Bessant, 2020).

At the organizational level, the focus is on the changes that accompanied technological implementation: adaptations in organizational culture, reconfiguration of processes, training and skills development policies, redefinition of roles and responsibilities, and improved internal communication. The premise is that organizational innovation is crucial to transforming technology into a competitive advantage, allowing it to be absorbed, exploited, and continuously optimized (OECD, 2018; Christensen, 2016). Thus, the research objective is not limited to inventorying initiatives or measuring isolated indicators, but to examining the dynamic interaction between technology, people, and processes, recognizing that competitiveness results from the balance between tangible resources such as infrastructure and systems and intangible resources such as knowledge, culture, and adaptability (Barney, 1991). By focusing on the case of MACON Transportes, this research seeks to generate useful learnings not only for the company but also for other organizations in the sector facing similar contexts, simultaneously reinforcing the practical relevance and academic value of the study.

General Objective

To analyze how the integrated management of technological and organizational innovation at MACON Transportes contributed to the construction and maintenance of competitive advantages between 2020 and 2024. Identifying the interrelationships between investments in technology, transformations in internal processes, development of human skills, and adaptation of organizational culture, in order to understand how these dimensions, when strategically articulated, enhance operational performance, customer satisfaction, and the company's competitive positioning in the Angolan road transportation market.

Specific Objectives

Within the scope of this research, the following specific objectives stand out:

- Analyze the technological and organizational innovation strategies implemented by Macon Transportes from 2020 to 2024.
- Identify the internal and external factors that influence

MATERIALS AND METHODS

Methodology

This study adopted a mixed approach, combining quantitative and qualitative methods to allow for a broader and more in-depth analysis of the phenomenon under study, ensuring greater rigor and credibility of the results (Creswell & Creswell, 2018). To achieve our objectives, we used the following research methods and techniques.

- Qualitative: According to Thiollent (2007), this method aims to answer questions that provide insight into the project and its surrounding environment, allowing for better analysis of the situation and theorization of the problem. Therefore, adopting this method for our research allowed us to analyze phenomena related to the impact of logistics and transportation infrastructure on the lives of the Angolan population.

- Quantitative: This method consists of reducing social, political, and economic phenomena, which provides a greater likelihood of measuring and processing the data (Marconi and Lakatos 2003). The use of this method was relevant to the research process, as it helped us quantify data, identify relationships between variables, and statistically analyze the data collected through the questionnaire. It also helped us select theories and draw conclusions using a representative sample of respondents to analyze their impact on families' lives.

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Research Techniques

Descriptive Technique: The descriptive technique is an approach in scientific research that focuses on the detailed analysis and interpretation of data to describe a specific phenomenon or situation. It is characterized by providing a comprehensive and detailed view of the object of study, without necessarily seeking causal explanations, as it sought to identify and characterize the Macon transport company in Angola. Within the scope of our study, the application of this technique allowed us to analyze in detail the perceptions, living conditions, and livelihoods of families. This descriptive approach provided a deeper and more contextualized understanding of the phenomenon, providing important data and recommendations with valuable arguments to guide future actions by the company under study.

Exploratory Technique: The exploratory approach in scientific research is a strategy that seeks to investigate a phenomenon without relying on pre-established hypotheses. This technique stands out for its flexibility, allowing for the exploration of new discoveries and an in-depth analysis of the phenomenon in question. For our study, it was useful for understanding the population's perceptions on the subject under analysis.

Documentary Research: Documentary research is a type of research that uses primary sources, that is, data and information that have not yet been addressed in scientific analysis or research. According to Rodrigues (2007), documentary research serves to answer a specific research problem, especially to complement bibliographic research. Regarding our research, the use of this technique allowed us to examine documents, legislation, institutional reports, books, articles, and studies related to the topic, which allowed us to obtain a broader and more in-depth perspective on the topic under study. Materials

The main materials used were:

- Structured questionnaires administered to Macon Transportes employees, customers, and managers, allowing for the collection of objective and quantifiable data.
- Semi-structured interviews conducted with members of the management team and transportation sector experts, enabling the understanding of perceptions, experiences, and practices related to technological and organizational innovation.
- Institutional documents and internal reports from Macon Transportes (2020–2024), which provided historical data, performance indicators, and records of innovation initiatives.
- Statistical databases and scientific literature to support the analysis and contextualize the study.

Methods

The study was developed in four main stages:

Primary Data Collection

Questionnaires were administered through digital platforms and in person, ensuring participant diversity.

In-person and virtual interviews were recorded with prior authorization, respecting ethical research principles (Resnik, 2020).

Secondary Data Collection

Documentary and bibliographic analysis of academic and institutional sources, allowing for a theoretical framework for the topic of innovation and competitiveness.

Data Analysis

- Quantitative data processed using Microsoft Excel and SPSS, allowing for statistical calculations and descriptive analysis.
- Qualitative data analyzed through thematic content analysis, identifying relevant patterns and meanings (Bardin, 2016).

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Information Triangulation

Cross-referencing of qualitative and quantitative results, ensuring greater validity and interpretative consistency (Flick, 2018). The adopted methodology ensures that the study not only

N= 100 angolanos

E_o =0,03 = 3%

n=?

n_o =?

$$n_0 = \frac{1}{E^2}$$

$$n = 1 + \frac{N.n_o}{N + n_o}$$

$n_o = 1 / (E_o)^2$
$n_o = 1 / (0,03)^2$
$n_o = 1111$
$n_o = (N \times n_o) / (N + no)$
$n_o = (100 \times 1111) (100 + 1111)$
$n_o = 111\ 100 / 1.211$
$n_o = 91,7$

n_o = 91.7, observing the rounding up, we will have n_o = 92 Respondents. With a tolerable sampling error of 3%.

Significance level test: $\frac{n.100}{N} = \frac{92x100}{100} = 92\%$

Based on the calculations, this implies that our sample is considered representative and significant because the significance test is greater than 50%, based on Daniel Bernoulli's theory, which states that when the sample result of the test is equal to or greater than 50%, the sample is considered significant.

RESULTS AND DISCUSSION

Results Analysis

The analysis of the collected data allows us to understand the sociodemographic profile of the study participants, which is essential for contextually interpreting the results related to the management of technological and organizational innovation at Macon Transportes.

Table 01. Gender

Gender	Frequency	Percentage (%)
Male	74	80
Female	18	20
Total	92	100

Source: Prepared by the authors based on the data collected, 2024

The sample consisted mostly of men (80%), while women represented 20%. This result is in line with the trend observed in the transportation sector, which traditionally has a male predominance, especially in operational and technical roles (Ferreira & Lopes, 2020). This distribution may influence how technological and organizational innovation is perceived and adopted, as different groups may have different expectations and resistance to change.

Table 2. Age Group

Age Group	Frequency	Percentage (%)
18-25 years	44	48
26-35 years	18	19
36-45 years	10	11

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46-55 years	8	9
55+ years	12	13
Total Sample	92	100

Source: Prepared by the authors based on the data collected, 2024

Most respondents were in the 18–25 age group (48%), followed by those aged 26–35 (19%) and those over 55 (13%). The significant proportion of young employees suggests a potentially greater openness to adopting digital technologies and new organizational practices (Rogers, 2003). However, the presence of more experienced employees is also an important asset, as it provides tacit knowledge and organizational history, essential for aligning innovation with the company's operational reality.

Table 3: Level of Education

Education Level	**Frequency**	**Percentage (%)**
Education Level	17	18
High School	43	47
Bachelor's Degree	18	20
Master's Degree	2	2
Doctorate	12	13
Total	92	100

Source: Prepared by the authors based on the data collected, 2024

The data indicate that 47% of participants have a high school diploma, 20% have a bachelor's degree, 18% only a primary school diploma, 13% have a doctorate, and 2% have a master's degree. This diversity of qualifications reveals that Macon Transportes has a heterogeneous human capital, which implies the need for differentiated training and development strategies to ensure that all employees can integrate and effectively utilize technological and organizational innovations (Nonaka & Takeuchi, 1995). Broadly speaking, the identified profile reveals a predominantly male, young workforce with diverse academic backgrounds. This composition can favor the adoption of innovations, provided it is accompanied by structured change management programs, internal communication, and ongoing training. From a strategic perspective, technological and organizational innovation management must consider these characteristics to transform age and qualification diversity into a sustainable competitive advantage, aligning skills, experience, and openness to new developments.

Table 4: Knowledge of Technological and Organizational Innovation Management

Reações	Frequency	Percentage (%)
Yes	83	90
No	9	10
Total	92	100

Source: Prepared by the authors based on the data collected, 2024

Analysis of Table 4 reveals that the overwhelming majority of respondents (90%) reported having knowledge of technological and organizational innovation management, while only 10% stated they had no such knowledge. These results indicate that Macon Transportes, from 2020 to 2024, developed or was exposed to practices that contributed to the dissemination of concepts and methodologies related to innovation. The high level of knowledge suggests that the organization has an environment conducive to the adoption of innovative strategies, integrating both technological and organizational aspects. According to Tidd and Bessant (2018), internal knowledge about innovation is a key element in creating sustainable competitive advantages, as it allows companies to adapt quickly to market changes and create differentiated solutions. From this perspective, Macon Transportes appears to be positioned to explore new opportunities and strengthen its competitiveness in the transportation sector. However, the 10% of employees who lack knowledge on the topic represent a margin that could compromise the full integration of innovative practices. As Schumpeter (1934) points out, innovation

depends not only on resources, but also on the human capacity to understand and apply new ideas. Therefore, it is recommended that the company invest in ongoing training and development programs, ensuring that all employees share a solid knowledge base. Thus, the data reflect that, although there is a strong culture of innovation, there is still room to expand the scope of organizational and technological literacy within Macon Transportes, consolidating its role as a strategic driver of competitiveness.

Table 5: Technological and Organizational Innovation Management Contributed as a Strategic Driver for Building Competitive Advantages at Macon Transportes (2020–2024)

Reactions	Frequency	Percentage (%)
Yes	78	84
No	14	16
Total	92	100

Source: Prepared by the authors based on the data collected, 2024

The analysis of the results shows that a significant majority of respondents (84%) recognize that technological and organizational innovation management at Macon Transportes, from 2020 to 2024, was a fundamental strategic driver for building competitive advantages. This finding reinforces the importance of investing in innovative processes that combine technology and organizational restructuring to improve the company's performance and responsiveness to market demands (Porter, 1989; Tidd & Bessant, 2020). On the other hand, 16% of participants expressed disagreement with this view. This percentage, although a minority, should not be underestimated, as it may indicate gaps in perception or internal communication regarding the real impacts of innovation on competitive strategy. This result suggests that, to consolidate sustainable advantages, it is equally necessary to strengthen the alignment between the strategic vision and employee understanding (Hamel & Prahalad, 1994). Overall, these data allow us to conclude that Macon Transportes has adopted innovation as a central pillar of its strategy, successfully creating the conditions to differentiate itself in the transportation sector in Angola. However, building lasting competitive advantages requires not only technological innovation but also cultural and organizational integration that allows all levels of the company to perceive and actively participate in its implementation (Barney, 1991).

DISCUSSION

The results reveal that 90% of respondents reported having knowledge about technological and organizational innovation management, while only 10% indicated they had no such knowledge. This finding is particularly relevant because it demonstrates that, within the context of Macon Transportes, the company's human capital is well-versed in innovation-related practices and concepts, which constitutes fertile ground for implementing competitive strategies. The high level of knowledge identified suggests that the company has an internal environment conducive to the adoption of new technologies and organizational management models, essential elements for maintaining and expanding competitive advantages in the transportation sector in Angola. As Tidd and Bessant (2021) argue, innovation should not be understood solely as the introduction of technology, but as a continuous process of value creation that integrates people, processes, and organizational strategies. This scenario aligns with Schumpeter's (1934) argument that innovation is a driver of creative destruction, replacing outdated practices with more efficient solutions capable of repositioning the organization in the market. In the case of Macon Transportes, a high level of literacy in innovation management can enhance structural transformations and process optimization, resulting in greater operational efficiency and customer satisfaction.

On the other hand, the existence of 10% of employees without knowledge in this area should not be overlooked. Such a gap can compromise the coherence of innovative initiatives, as innovation requires alignment and collective participation (Drucker, 2002). Therefore, it is recommended that the company invest in ongoing training, ensuring that all employees share a common core of skills and strategic vision. Overall, the data confirm that the management of technological and organizational innovation is perceived and, to a large extent, mastered by Macon Transportes' employees. This reality constitutes a significant strategic advantage, capable of sustaining the company's growth and competitiveness during the period analyzed (2020–2024), provided it is accompanied by consistent policies for updating and integrating the entire workforce.

CONCLUSION

This research revealed that managing technological and organizational innovation is a key strategic driver for building and sustaining competitive advantages in the transportation sector in Angola, with particular emphasis on the case of Macon Transportes from 2020 to 2024. The results showed that innovation, when aligned with a clear strategy and a long-term vision, transcends the mere adoption of technologies, implying a structural, cultural, and procedural reconfiguration of organizations (Tidd & Bessant, 2021). In the case study, it was found that Macon Transportes successfully integrated technological innovation through the digitalization of processes, implementation of electronic ticketing systems, and real-time fleet monitoring with organizational innovation, marked by internal restructuring, logistics optimization, and strengthening of human resources training. This strategic alignment has enabled significant gains in operational efficiency, customer satisfaction, and market positioning, confirming Porter's (1990) view that competitive advantages are built on a company's ability to innovate and continuously improve. Furthermore, Macon's experience demonstrates that organizational innovation is an inseparable complement to technological innovation, as it enables the cultural and structural adaptation necessary for new solutions to be effective and sustainable (OECD, 2018). However, the study also revealed challenges, such as the need for greater investment in digital infrastructure, policies to encourage innovation, and strengthening employees' technical skills. These points confirm that building competitive advantages is an ongoing process and depends on organizational learning capacity (Nonaka & Takeuchi, 1997), as well as adaptation to changes in the economic and social context. In summary, we conclude that Macon Transportes constitutes a practical example of how innovation management, understood in an integrated and strategic manner, can be a driver of differentiation and sustainable growth. This reality reinforces the importance of business and public policies that encourage innovation in the transportation sector, contributing to economic development and improved mobility in Angola.

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