Factors influencing future scenario planning for sports organizations offering tennis-training programs

Factores que influyen en la planificación de escenarios futuros para organizaciones deportivas que ofrecen programas de entrenamiento de tenis

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Abstract

Introduction: In the post-COVID-19 context, sports organizations must anticipate economic and social changes by developing capacities to identify future trends. Future scenario planning emerges as a strategic tool to support sustainability and decision making.
Objective: To identify the key variables and stakeholders influencing future scenario planning in sports organizations offering tennis training programs, to support strategic decision making in a post-COVID-19 environment.
Methodology: A strategic prospective approach was applied using MICMAC and MACTOR methods, supported by retrospective analysis. The Antioquia Tennis League (Colombia) served as the case study, with analyses conducted by a prospective working group.
Results: Sixteen key variables and twelve influential stakeholders were identified. Variables related to professional development and support staff had the greatest impact, highlighting the need for employee support strategies focused on stress management and burnout reduction.
Discussion: The findings align with previous studies emphasizing human resource management, adaptability, and organizational resilience as critical factors in sports organizations under uncertainty.
Conclusions: Flexibility and adaptability strengthen internal relationships and staff performance, contributing to more effective future planning and organizational decision making.

Keywords

Future; MACTOR; MIC MAC; post-COVID-19; sports organizations.

Resumen

Introducción: En el contexto post-COVID-19, las organizaciones deportivas deben anticipar los cambios económicos y sociales mediante el desarrollo de capacidades para identificar tendencias futuras. La planificación de escenarios futuros se consolida como una herramienta estratégica para apoyar la sostenibilidad y la toma de decisiones.
Objetivo: Identificar las variables y los actores con mayor influencia en la planificación de escenarios futuros en organizaciones deportivas que ofrecen programas de formación en tenis, con el fin de apoyar la toma de decisiones estratégicas en un entorno post-COVID-19.
Metodología: Se aplicó un enfoque de prospectiva estratégica utilizando los métodos MICMAC y MACTOR, complementados con análisis retrospectivo. La Liga de Tenis de Antioquia (Colombia) se empleó como caso de estudio, y los análisis fueron realizados por un grupo de trabajo prospectivo.
Resultados: Se identificaron dieciséis variables clave y doce actores con influencia significativa. Las variables relacionadas con el desarrollo profesional y el personal de apoyo presentaron el mayor impacto, lo que evidencia la necesidad de implementar estrategias de apoyo al talento humano enfocadas en la gestión del estrés y la reducción del burnout.
Discusión: Los hallazgos son consistentes con estudios previos que destacan la importancia de la gestión del talento humano, la adaptabilidad y la resiliencia organizacional en contextos de incertidumbre.
Conclusiones: La flexibilidad y la adaptabilidad fortalecen las relaciones internas y el desempeño del personal, contribuyendo a una planificación futura y a una toma de decisiones organizacional más efectiva.

Palabras clave

Futuro; MACTOR; MICMAC; pos-COVID-19; organizaciones deportivas.

Introduction

Prospective analysis can be defined as an empowering tool that fosters innovation and supports organizations in developing efficient strategies that improve decision-making, reduce uncertainty, and strengthen sustainability and competitiveness (Sekulic et al., 2020; Osorio-Moreno et al., 2018). The research topic focuses on future scenario planning for sports organizations that offer tennis training programs. This area of study involves developing prospective strategies that allow these organizations to anticipate and prepare for possible changes, challenges, and opportunities in the sporting environment (Haghparast et al., 2025). By focusing on tennis as a specific context, this study aims to examine how organizations can identify and evaluate potential scenarios that may impact their long-term operation and success (Lagoudaki et al., 2025).

Future scenario planning provides a valuable tool for strategic decision-making, enabling sports organizations to proactively adapt to changing conditions and take advantage of new opportunities to improve the quality of their training programs and the performance of their athletes enabling sports organizations to proactively adapt to changing conditions and strengthen both organizational management and athlete performance (Brouwers et al., 2015).

The COVID-19 crisis presented sports organizations worldwide with unprecedented challenges that highlighted the need for foresight and planning to identify key variables and stakeholders and to devise strategies to counteract negative effects (Drewes et al., 2021; Grix et al., 2021; McGuine et al., 2021). In this regard, González (2020) suggests that structural analysis and stakeholder mapping, based on methods such as MICMAC and MACTOR, are key to understanding system dynamics by identifying influential variables and actors (Dmytriyev et al., 2021; Freeman et al., 2021). These models acknowledge that stakeholders and variables interact dynamically to shape the outcomes of present and future decisions (Bischoff et al., 2025). This highlights the importance of strategic planning to address sudden disruptions and capitalize on emerging opportunities in the sports industry (Yang et al., 2025; Glebova et al., 2022). Sports organizations, therefore, must adopt innovative and proactive actions to sustain operations and explore new models of engagement (Escamilla et al., 2020; Malik et al., 2025).

Research on digital technologies in sports highlights the need to anticipate and address challenges related to athlete well-being and competitive integrity in the digital era (Vanoye et al., 2025). Particularly in the evaluation of performance in tennis. However, the impact of integrating technology on the effectiveness of assessment, as well as the challenges associated with its implementation, remain underexplored (Nurfadhila et al., 2026). Therefore, more effective learning approaches are needed to improve students' learning outcomes (García-Mayor et al., 2024).

By integrating this knowledge, the issue of planning future scenarios for sports organizations offering tennis training programs can be defined as a crucial field of study (Hakim et al., 2025). This seeks to use forward-looking tools to adapt to changes in the sports environment, take advantage of new opportunities, and ensure the well-being of athletes while maintaining competitive integrity (Qi et al., 2024).

Several studies emphasize the significance of utilizing prospective analysis and structural analysis models in the context of sports organizations, particularly during crises such as the COVID-19 pandemic. However, there is a significant gap in the academic literature regarding the specific application of these tools in the sports field (Moradiet al., 2025). This is especially true in terms of crisis management, strategic decision making, and relationships with stakeholders (Tachkova & Brannon, 2025). Additionally, there is a clear need to explore innovative strategies for the reinvention of these organizations in times of adversity (Sindakis et al., 2025). This area has not yet been exhaustively researched (Hongyu & Enfeng, 2023; Morrison & Misener, 2021). Therefore, the current work aims to fill this gap by investigating how prospective analysis and structural analysis models can be adapted and used effectively in sports organizations (Tao & Yu, 2025). The study also proposes innovative strategies for their reinvention in times of uncertainty and change (Pomorska & Thomas, 2025). This will contribute to the advancement of knowledge in the field.

In view of the above, the objective of this study is to identify and analyze the key variables and stakeholders that influence future scenario planning in sports organizations offering tennis training pro-

grams, using foresight tools such as MICMAC and MACTOR within the Antioquia Tennis League (Colombia) as a case study. For this, it is proposed: How can organizations prepare for changes, challenges, and opportunities in the sports environment using foresight tools?

The article starts with an abstract, which gives a summary of the study. The introduction establishes the topic's context and presents the research objectives. Next, the theoretical framework presents the relevant literature review and establishes the study's conceptual foundations (Dadhich et al., 2025). The methodology describes the procedures used to conduct research, including data collection and analysis. The study's results and analysis are presented in the following section (Padgett et al., 2025). The conclusions provide a summary of the main findings and offer reflections on the study's implications and potential future research directions (Daniels, 2025). The conclusions provide a summary of the main findings and offer reflections on the study's implications and potential future research directions.

In view of the above, the objective of this study is to identify and analyze the key variables and stakeholders that influence future scenario planning in sports organizations offering tennis training programs, using foresight tools such as MICMAC and MACTOR within the Antioquia Tennis League in Colombia as a case study, in order to support strategic decision making and long-term organizational sustainability.

Method

The methodology implemented in this study is based on the strategic prospective toolbox proposed by Michel Godet and on three methods that will be described below. The study followed four sequential phases: (i) preparatory scoping and preliminary listing of variables and stakeholders (literature review and expert workshops), (ii) structural analysis with MICMAC to assess direct and indirect influence–dependence among variables, (iii) stakeholder analysis with MACTOR to estimate power relations, convergences and divergences among actors, and (iv) a retrospective analysis session to validate salience, refine the final selection and interpret actionable implications for tennis-training organizations.

Participants

Participants and selection procedures. We used purposive expert sampling to convene a foresight team with proven knowledge of tennis operations and organizational decision-making. Inclusion criteria: (a) ≥5 years of experience in roles linked to training, governance, operations or performance in tennis; (b) familiarity with planning and evaluation processes in sports organizations; (c) availability for all workshops. Exclusion criteria: current conflicts of interest with the League's procurement/sponsorship decisions or ongoing disciplinary proceedings. Recruitment occurred via formal invitations issued by the League and the research team to candidate profiles nominated by the Executive Board and senior coaches. Thirteen experts met criteria and consented to participate. To mitigate groupthink and broaden perspectives, we invited three external reviewers (academia/industry) with no direct link to the League to act as independent validators during the scoping and validation steps.

Sample size justification. Expert panels of 12–18 members are commonly reported in prospective and structural-analysis studies; our n=13 (+3 external validators) aligns with this guidance and ensured heterogeneity of roles while preserving group deliberation effectiveness.

To enrich the analysis and ensure a more holistic, open, and unrestricted view, three individuals with no direct relationship with the Antioquia Tennis League or sports organizations were also included. Their participation sought to broaden the scope of the exercise, contributing new perspectives that would allow for a more impactful and assertive approach.

The profiles of the participants in this exercise include: an active competitive tennis player, a former president of the Antioquia Tennis League, a former competitive player, a parent of a young athlete, a tennis club administrator, an Antioquia Tennis League instructor, a coach of the Antioquia tennis team, a sports coordinator of the League, a research professor, an international guest researcher, a coaching coordinator, an executive director, and a master's student.

All participants were verbally informed and provided voluntary consent to participate in this study. The details of their participation, the purpose of the data collected, and the measures taken to ensure confidentiality during and after the study were explained in detail. Participation in this project was voluntary. Interviewees were given the opportunity to ask questions and clarify any doubts before confirming their consent to take part in the research.

Procedure

Structural analysis allows for the determination of the key variables of a given system and their position within it, based on their relevance. This methodology clearly demonstrates the relationships between the variables that characterize the system under study and identifies the key variables on which prospective reflection should focus (Cely, 1999). We first compiled a preliminary list of 39 variables from literature and scoping workshops. Each variable received an operational definition and examples (instrument A, Appendix). Experts independently populated a 39×39 direct influence matrix (M) rating the effect of variable i on j using a 0–4 scale (0 = no influence; 4 = strong, systemic influence). Self-influences were fixed at 0. We then computed indirect influences via matrix powering until stability (M^n), obtaining global influence and dependence scores. Positioning in the classical influence dependence map produced five quadrants (drivers, links, outcomes, platoon, excluded). Calculations were carried out in Excel, with verification scripts and manual audit of outlier cells (±2 SD from panel mean) (Godet, 2000).

According to Godet (1997), structural analysis is carried out in three stages: first, the system variables are listed; second, the relationships between these variables are described; and third, the key variables are identified, as well as their categories and interpretation. To carry out this analysis, the team in charge of the prospective exercise relied on the opinions of the key stakeholders and/or experts who comprised the prospective team, all of whom were linked to the Liga Antioqueña de Tenis de Campo system.

The purpose of this analysis was to identify the main variables that would prove to be the most influential and dependent within the system, since these are the ones that enable its evolution (Garza & Cortez, 2011). To this end, the variables were entered into a cross-impact matrix (MICMAC) in an Excel file, which was subsequently sent to the members of the foresight team. Each of them, based on their experience, assigned a score between 0 and 4 to each variable, depending on the level of influence it exerted on the others.

Selection criteria for the 16 key variables. We retained variables by meeting any of the following a-priori rules: (1) driver or link quadrants; (2) top quartile of global influence or dependence; (3) expert salience ≥70% agreement in the validation session (binary keep/drop vote with rationales). Variables in the platoon/excluded quadrants were discarded unless explicitly rescued by criterion (3) with documented justification.

The importance of the MACTOR technique, also known as the actors' game, lies in the fact that all actors participating in a given system have different ways of carrying out their actions, achieving their objectives, and developing their projects (Cely, 1999). We constructed an initial list of 35 stakeholders with definitions and role descriptors (instrument B). Experts completed a direct influence matrix (MID, actors×actors) using the 0–4 scale. We computed actor power (row sums with indirect effects) and dependence (column sums), plus convergence/divergence vectors on key objectives (instrument C). Outputs included actor rankings, influence–dependence mapping, and alliance/conflict diagnostics. Therefore, this methodology seeks to evaluate the power or strength relationships between different actors, with the purpose of analyzing their convergences and divergences around a set of associated positions or objectives (Garza & Cortez, 2011). Furthermore, it offers actors support tools for making decisions regarding the implementation of alliance or conflict policies (Godet, 2000).

According to Godet (1990), the application of the MACTOR method involves three main stages. First, the actors that control or influence the key variables obtained in the structural analysis are identified (actor list). Second, the strategic objectives of these actors with respect to these variables are determined (objective list). Finally, the direct influences between actors are assessed using an influence matrix (a matrix of actors versus actors), which allows them to be ranked according to their level of influence.

To develop the stakeholder game using the MACTOR technique, a procedure like that used with the MICMAC method was followed. All actors were entered into a matrix created in an Excel file, which was subsequently sent to the prospective team members. Based on their experience, each member assigned

a score between 0 and 4, depending on the level of influence each actor exerted on the others. Selection criteria for the 12 stakeholders. Actors were retained if they satisfied both: (1) power in the top quartile or placement in the link/dominant quadrants; and (2) strategic relevance confirmed by experts (≥70% keep vote). Ties were resolved considering positive net convergence on priority objectives and documented organizational leverage.

Instrument

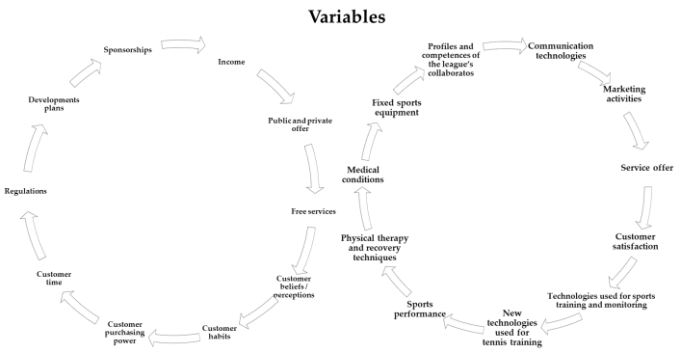
We designed three instruments: A) MICMAC variable definitions and rating sheet (39×39 matrix); B) MACTOR actor descriptors and MID rating sheet; C) a semi-structured guide for the retrospective session. Content validity was ensured through two rounds of expert review (13 insiders + 3 external validators) following a modified Lawshe procedure: items lacking essentiality consensus were revised or removed; wording was standardized and examples added. We conducted a pilot with two mock matrices to verify scale comprehension and timing, leading to minor layout adjustments. Reliability and agreement. Discrepancies were addressed in a short calibration session (10–15 minutes) before the final rating.

All organizations consider it important to know their strengths and weaknesses and must rely on their differentiating aspects to transform them into key factors for success so that they can deal with all those that are, or will be, their sectors of activity. This deep knowledge of the organization, when confronted with the evolution of the environment, constitutes a great source of innovation, which is the object of retrospective analysis (also known as paradigmatic liberation or strategic diagnosis).

Therefore, sports organizations are not detached from different conditions. In the case of Antioquia Tennis League, the objective of the retrospective analysis focused on obtaining an in-depth picture of the organization to consider its distinctive competencies and latent needs, as well as a realistic idea of its current dynamics. For this purpose, an exhaustive data collection was performed. This data collection focused on the system that was previously defined by the experts, which is represented by a set of stakeholders and variables, as illustrated in Figures 1 and 2, respectively.

Figure 1. Stakeholders of the system

Figure 2. Variables of the system



Based on these stakeholders and variables that were previously prioritized, the experts were encouraged to provide assessments represented in value judgments by means of various types of questions associated with each element, such as: What is the position of Antioquia Tennis League regarding the element under evaluation? What does the future hold for it? What are its key strengths or factors? What are its weaknesses? In this phase, we were able to obtain a broad picture of the current situation of the Antioquia Tennis League and of how it has operated in the past. This, in turn, made it possible to collect mainly qualitative elements, which can later be contrasted by means of indicators and figures to compare current–future conditions with the historical ones and establish levels of progress or transformation.

Data analysis

Notes and transcripts from scoping and retrospective sessions were analyzed using thematic analysis (Braun & Clarke). Steps: (1) familiarization and initial memos; (2) open coding by two analysts; (3) codebook consolidation; (4) axial coding to cluster mechanisms (e.g., technological enablers, human-capital stressors, governance levers); (5) theme review against MICMAC/MACTOR quantitative outputs (methodological triangulation); (6) definition and naming of themes; (7) evidence mapping to scenarios. We double-coded 20% of materials and discussed disagreements until consensus; an audit trail (decisions, codebook versions, rescue criteria) is provided in the Appendix. Identifiers were anonymized, and materials were stored in an institutional repository with access control.

Results

This section presents the quantitative and qualitative results derived from the MICMAC and MACTOR analyses. For transparency and systematic reporting, results are structured in three parts: (1) structural analysis of variables, (2) stakeholder analysis, and (3) integration of findings through retrospective sessions to define future scenarios. Quantitative indicators, frequency counts, and influence–dependence metrics are included in Figures 3–4 visualize the relational maps.

Subsequently, some retrospective analysis sessions were held with the prospective team, and after some discussions and analyses, the number of variables and stakeholders were reduced to 16 and 12, respectively. These variables and stakeholders were found to be the most influential in the future scenario planning of sports organizations that offer tennis training programs. The results obtained from each designed and applied tool are described below.

The predominance of driver/link variables and interdependent stakeholders suggests a complex adaptive system in which technology and human-capital mechanisms jointly shape organizational resilience. This aligns with prior work evidencing that digital enablers can buffer shocks while human-centered policies sustain performance and commitment in sports organizations (e.g., innovation and CSR in tennis clubs; strategic planning in nonprofits; green operations in Grand Slams; sponsor leveraging through digital content). The observed configuration, therefore, supports a dual pathway to resilience: technological reinforcement and human centered sustainability, which our scenario analysis operationalizes for tennis-training contexts.

Results obtained with the MICMAC tool (structural analysis)

The structural study conducted is summarized in Figure 3, which presents a graph accompanied by a list of variables. This graph is made up of two axes: a vertical one representing influence and a horizontal one indicating dependence. To facilitate understanding of the analysis, the graph was divided into quadrants, each identified with a name and a specific color. In total, 39 variables selected by the foresight team were evaluated, their positions within the system visually represented in the graph. The distribution shows in Table 1 that 53.8% of variables (Input + Link) exert a strong systemic influence, guiding the prioritization of the 16 final variables selected for scenario design.

Table 1. Quantitative summary of MICMAC variables by quadrant

Quadrant	Number of variables	Percentage (%)	Examples of variables	Influence–Dependence range (mean ± SD)
Input (Drivers)	14	35.9	Communication tech., medical conditions, sponsorships	3.5 ± 0.4
Link	7	17.9	Marketing activities, customer satisfaction	3.2 ± 0.5
Outcome	0	0	—	—
Platoon	15	38.5	Nutrition, coaches' time, user location	2.0 ± 0.6
Excluded	3	7.7	Facilities, age of coaches	1.4 ± 0.2

To interpret the results, the variables grouped by quadrant were analyzed. At the end of this section, a retrospective analysis is also included that delimits and validates the key variables selected by the team to guide future scenario planning.

First, the red quadrant corresponds to the excluded variables. Based on the scores assigned by the foresight team, three variables were discarded: facility, location, and the age or age range of the coaches. Although these elements are present within the tennis system, their low influence and dependence make them of little relevance in terms of future planning for sports organizations that offer training in this discipline.

On the other hand, the yellow quadrant groups the so-called platoon variables. In this case, fifteen variables were identified that, according to prospect theory, do not have significant levels of influence or dependence. These include computer technology and hardware, technologies applied to training, nutrition, mental health, sportswear, mobile equipment, common areas, store products, sporting goods, climate or environment, coaches' time and availability, remuneration, expenses and costs, users' georeferenced location, and training and leisure modalities. Since they do not mobilize the system or depend on it, these variables are excluded from the prospective analysis.

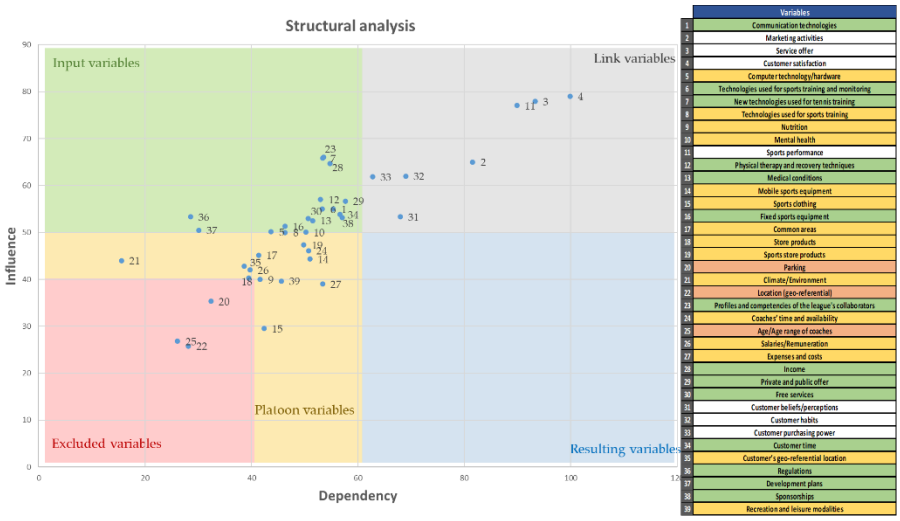
It should be noted that the blue quadrant, intended for outcome variables, did not present any variables in this analysis. This indicates that no completely dependent elements were identified within the system of sports organizations focused on tennis training.

In contrast, the green quadrant contains the input variables, those that generate direct influence on the system. A total of fourteen variables were recognized in this category: communication technologies, sports monitoring tools, new technologies applied to tennis, physiotherapy and recovery techniques, medical conditions, fixed sports equipment, league staff profiles and competencies, revenue, public and private offerings, free services, regulations, development plans, and sponsorships. These variables, by modifying their behavior, provoke responses in the system and require strategic decisions for their proper management.

Finally, the gray quadrant groups the link variables, characterized by their high influence and dependence within the system. Seven variables were classified in this category: marketing activities, customer satisfaction, service offerings, sports performance, user beliefs and perceptions, consumer habits, and purchasing power. Due to their ability to trigger changes and mobilize decisions, these variables are essential for building future scenarios in sports organizations that provide tennis education.

The absence of pure outcome variables and the concentration of items in driver/link quadrants indicate that leverage points are upstream (technology, governance, financing) rather than downstream outcomes. Practically, this means interventions should prioritize communication technologies, monitoring tools, regulations, development plans and sponsorships (drivers) to indirectly shift marketing activities, customer satisfaction and performance (links). This structure is consistent with studies showing that digital infrastructures and policy frameworks precede measurable performance gains in racquet sports organizations.

Figure 3. Structural analysis



After conducting a retrospective analysis of the initially considered variables, the foresight team conducted a prioritization exercise that reduced the set of 39 variables to just 16. This refinement was based on the exclusion of those variables whose level of influence and dependence was not significant enough to mobilize the system or impact its evolution. Thanks to this process, it was possible to identify which elements should be considered key in planning future scenarios for sports organizations dedicated to tennis training.

The central criterion for this selection was each variable's ability to actively intervene in the system, either as a trigger for change or as a factor sensitive to transformations. Thus, the team was able to focus the foresight analysis on truly strategic components, leaving aside those whose role in the future of the system is marginal.

The variables ultimately selected include technological, physical, human, and economic aspects. First, computer and hardware technology stands out, including tools such as Microsoft Windows, personal computers, cameras, digital scoreboards, and stopwatches, essential for managing and monitoring sports activities. Added to this are specific technologies used in training, such as the ball launcher, catcher, and feeder, which optimize technical tennis practice.

In the area of health and wellness, nutrition, including supplements and foods geared toward athletes, and mental health, recognized as a critical component of athletic performance, were considered fundamental. Sportswear, encompassing both specialized clothing and footwear, was also included.

Common areas, such as saunas, restrooms, restaurants, and gyms, were included for their impact on the overall user experience, as were the products offered in stores, food, beverages, and fruits, and the items available in sports stores, such as clothing and equipment. Parking, although logistical, was recognized as an important variable in user comfort and accessibility.

Likewise, factors related to human resources were incorporated, such as the time and availability of coaches, as well as their age or age range, both relevant to assessing the quality and pedagogical approach of training processes. Economic variables were also included, including staff salaries or wages, and expenses and costs associated with the operation of sports facilities, such as maintenance and travel.

Finally, two user-centered variables were highlighted: customer habits, which directly influence the design of services and strategies, and recreational and leisure activities, such as access to movies, gyms, or other complementary activities, which enrich the value proposition of sports organizations.

These 16 variables were defined by the foresight team as the most relevant for guiding strategic decision-making in future scenarios, allowing for more precise, realistic planning aligned with the dynamics of the sports environment.

Results obtained with the MACTOR tool (stakeholders' game)

Figure 4 presents the results obtained using the MACTOR tool, which allows us to visualize the role played by different stakeholders within tennis-focused sports organizations. This figure includes a two-way graph and a list of stakeholders evaluated. The graph is composed of two axes: the vertical axis represents the level of influence, while the horizontal axis indicates the degree of dependence. To facilitate analysis, the graph was divided into quadrants, each with distinct names and colors, allowing for a clearer and more structured interpretation of the data. In total, 35 stakeholders selected by the foresight team were analyzed in Table 2.

Table 2. Quantitative summary of MICMAC variables by quadrant

Quadrant	Stakeholders (n)	%	Representative examples	Mean influence score
Dominant	3	8.6	Political actors, IT service providers	3.7
Link (Mutual influence)	18	51.4	Sponsors, athletes, clubs, media	3.4
Autonomous	12	34.3	Indirect competitors, referees, assistants	1.9
Dominated	2	5.7	Fans, recreational athletes	1.5

These results indicate that over half of the stakeholders (51.4%) belong to the link quadrant, showing strong interdependence between operational and governance actors. Political and technological actors emerge as system drivers with high power (mean 3.7), suggesting that public–private cooperation is essential for scenario viability. The high share of link actors (clubs, sponsors, media, athletes, coaches) reveals mutual exposure to strategic moves small policy shifts by dominant actors (political, IT providers) can propagate system-wide. This also causes trade-offs: accelerating digital transformation may stress staff capabilities and raise burnout risk if not matched with support and training, echoing evidence of pandemic-related stress in sport professionals. Hence, co-investment agreements (public–private) paired with well-being programs are not optional add-ons but risk-mitigation necessities for scenario viability.

The results of the analysis are organized and described based on each of the quadrants defined in the graph. Additionally, a retrospective analysis is presented at the end of this section, delineating the key stakeholders identified as priorities by the foresight team.

The so-called autonomous stakeholders are in the red quadrant. A total of twelve actors were identified: corporate actors, tennis court equipment suppliers, teaching material providers, indirect competitors, external oversight bodies, club assemblies, administrative collaborators, umpires, support staff, and administrative staff. According to the assessment, these actors do not have a direct relationship with the tennis organizational system, as they neither exert influence nor depend on it. For this reason, they are considered marginal and are not prioritized in the analysis of future scenarios.

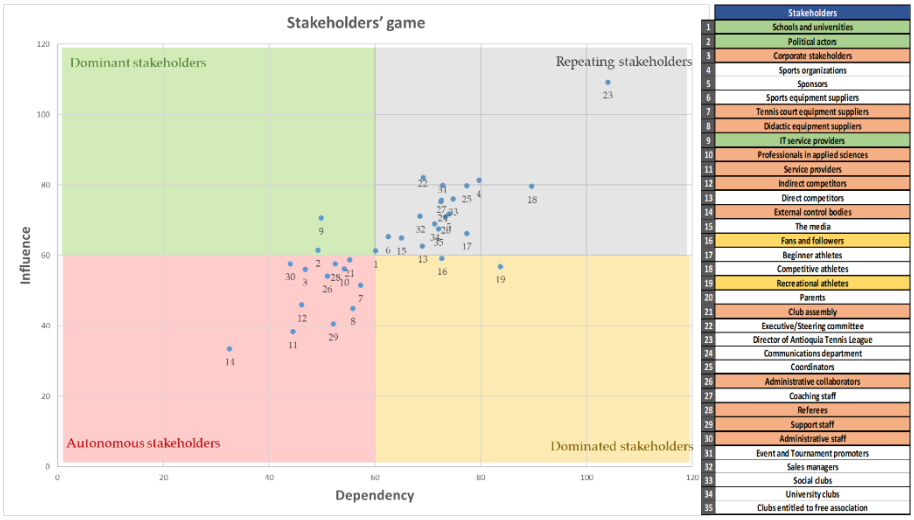
The yellow quadrant groups dominated actors, that is, those with a low level of influence. This group includes two actors: fans or followers and recreational athletes. Like autonomous actors, their limited capacity to energize the system prevents them from being included as relevant elements in future scenario planning.

In contrast, the green quadrant contains dominant actors, characterized by exercising significant influence over the system. This group is made up of three key actors: educational institutions (schools and universities), political actors, and IT service providers. Due to their ability to mobilize decisions within the organization and influence other stakeholders, these are considered strategic and should be the subject of detailed analysis.

Finally, the gray quadrant groups the so-called repeating stakeholders. Eighteen stakeholders were identified in this category: sports organizations, sponsors, sports equipment suppliers, direct competitors, the media, athletes in their early stages, competitive athletes, parents, the executive or management committee, the director of the Antioquia Tennis League, the communications department, coordinators, coaching staff, event and tournament promoters, sales managers, social clubs, university clubs, and clubs with the right to free association. These stakeholders not only mobilize the system but are also affected by other stakeholders. Due to this dual nature of influence and dependence, their role is

fundamental in the analysis of stakeholders that influence future scenario planning for sports organizations focused on tennis education.

Figure 4. Stakeholders' game



Discussion

After analyzing each of the proposed stakeholders and conducting a retrospective analysis, the foresight team prioritized them and reduced their number from the initially identified 35 to a total of 12. This refinement allowed for a more precise identification of which stakeholders could significantly intervene in future scenario planning for sports organizations focused on tennis training.

The selection focused on those stakeholders who, due to their level of involvement, impact capacity, or operational relevance, have a direct or indirect impact on the organizational system. In this way, a group of strategic stakeholders was established whose participation is essential in decision-making processes and in the design of viable and sustainable foresight scenarios.

The twelve stakeholders defined by the foresight team are as follows: corporate stakeholders, representing institutional and management interests; tennis court equipment suppliers, who provide items such as nets, chairs, and clay, among others; and suppliers of teaching materials, such as cones and ropes. Applied science professionals, including nutritionists, physical therapists, and psychologists, who contribute to the overall well-being of athletes, were also considered.

This list also includes service providers, responsible for tasks such as facility maintenance and in-store service; indirect competitors, such as movie theaters, gyms, other sports disciplines, and leisure activities that compete for the target audience's free time; and external oversight bodies, such as tax auditors, the Superintendency of Industry and Commerce, and the DIAN (National Institute of Sports and Commerce).

Likewise, stakeholders related to the operational and administrative environment of organizations were included, including fans and followers, whose support can influence the social legitimacy of sport; administrative collaborators, such as assistants and accounting and financial staff; referees or umpires, who ensure compliance with the rules during competitions; support staff, consisting of caddies, court monitors, and ball boys; and finally, administrative staff, responsible for logistical and operational functions, including administrative assistants, maintenance, and cleaning staff.

It is worth noting that the results obtained after selecting and combining these variables, through hypothesis construction and the definition of possible future scenarios, have been developed in a second

research article entitled "Challenges and Scenarios for Organizations Offering Tennis Training Programs" (López et al., 2024), currently in press. This new study broadens the understanding of the challenges and opportunities faced by sports organizations in this specific field.

The cross-analysis in Table 3 highlights two dominant future scenarios:

- Scenario 1 – Technological Reinforcement: Driven by IT providers, communication technologies, and sponsors; emphasizes digital integration and performance analytics.
- Scenario 2 – Human-Centered Sustainability: Driven by mental health, coaching, and user satisfaction; focuses on employee support, burnout reduction, and long-term retention.

Table 3. Final prioritization and scenario implications

Category	Element	Influence score	Dependence score	Strategic implication
Variable	Communication technologies	3.8	3.0	Essential for digital transformation of training programs
Variable	Marketing activities	3.5	3.6	Strengthens brand loyalty and revenue diversification
Variable	Mental health	3.1	2.7	Requires well-being programs for staff and athletes
Stakeholder	Sponsors	3.6	3.4	Key for economic sustainability
Stakeholder	Coaches	3.3	3.5	Critical for operational adaptation
Stakeholder	IT providers	3.9	2.8	Enable innovation through technological infrastructure

Both scenarios are complementary: the first ensures operational modernization, while the second preserves organizational resilience and well-being.

Scenario A – Technological Reinforcement. Triggered by IT providers, communication technologies, monitoring tools and sponsors.

Implications (practice): invest in data capture + analytics, standardize EHR/athlete load dashboards, and integrate remote coaching.

Implications (theory): supports the view that infrastructural drivers preceded capability reconfiguration in sports systems.

Scenario B – Human-Centered Sustainability. Triggered by coaches, mental health, customer satisfaction, service design.

Implications (practice): implement POS (perceived organizational support) programs, anti-burnout protocols, and career pathways for staff; redesign service mix to stabilize demand.

Implications (theory): advances a stakeholder-wellbeing mechanism as a mediator between shocks and performance continuity.

Similar studies

The study shows that prospective planning is effective in anticipating and preparing for possible changes in the sports environment. Organizations that implemented prospective strategies were better able to adapt to unexpected situations, such as the COVID-19 crisis, and make informed decisions to mitigate its negative impacts. The study also identified areas for improvement in the strategic management of sports organizations, particularly in the integration of emerging technologies and consideration of environmental aspects to ensure long-term sustainability. These results demonstrate similarities and differences with other related studies in the field. For instance, a study on the innovation programs of the Royal Spanish Tennis Federation emphasizes the significance of innovation in the tennis field (Crespo et al., 2022). Both studies acknowledge the importance of adapting to change and seeking new opportunities. However, this study specifically focuses on prospective scenario planning to assist sports organizations in facing future uncertainties and making informed strategic decisions. Similarly, this study explores the conditions for strategic planning in non-profit community sports, emphasizing the need to consider multiple factors in decision-making (Morrison and Misener, 2021). Both studies highlight the importance of adequate strategic planning to ensure the long-term success of sports organizations.

On the other hand, a study on environmental sustainability in Grand Slam tennis provides a distinct viewpoint on the significance of incorporating environmental factors in sports management (Trendafilova et al., 2021). Although the study focuses on environmental sustainability, both works share the common goal of enhancing management and planning in the tennis industry from a forward-looking perspective. A study on technological advances in sports has highlighted the crucial role of artificial intelligence, virtual and augmented reality, and data visualization in analyzing sports performance (Cossich et al., 2023). Although this research recognizes the importance of technology in the sports field, it focuses on the application of prospective tools for strategic decision-making in the specific context of sports organizations that offer tennis training. This statement highlights the diversity of approaches within the field and emphasizes the need to consider multiple perspectives to address challenges and opportunities in sport.

Quantitative findings from MICMAC and MACTOR converged to delineate two plausible futures. The predominance of link variables (17.9%) and interdependent stakeholders (51.4%) evidences a complex adaptive system where digital transformation and human sustainability coexist as strategic imperatives. The following discussion interprets these configurations considering post-COVID organizational resilience.

Limitations

First, MICMAC/MACTOR relies on expert ratings; although we used structured scales and validation, residual subjectivity may remain. Second, the single case focus (Antioquia Tennis League) limits external validity; transfer requires contextual mapping. Third, we did not quantify cost benefit or simulate policy shocks; future work should embed sensitivity analyses and longitudinal tracking to test scenario persistence.

Conclusions

We showed that in tennis-training organizations the system was driven primarily by upstream technological and governance variables, along with interdependent link variables (marketing, satisfaction, and performance). This structure clarified where interventions were most effective (drivers) and how ripple effects reached organizational outcomes (links). We integrated MICMAC and MACTOR with a qualitative retrospective lens to propose a dual-path resilience model. This model consisted of Technological Reinforcement (infrastructural enablers) and Human-Centered Sustainability (well-being and service design), which jointly explained adaptive capacity in post-shock contexts.

Scenario A recommended coordinated digital investments among IT providers, sponsors, and clubs, as well as improvements in data governance and the integration of remote services. Scenario B emphasized the implementation of professional orientation and support (POS) programs, anti-burnout protocols, and the redesign of the service portfolio to stabilize demand and retention. Public bodies were found to be able to accelerate organizational readiness through regulatory simplification, innovation vouchers for performance technologies, and joint health–sport protocols aimed at safeguarding staff and athletes. The findings stemmed from a single-case expert design; therefore, replication and longitudinal validation were required to assess generalizability and scenario persistence.

To determine which variables and stakeholders had the greatest dependence and influence in future scenario planning for sports organizations focused on tennis, we carried out several methodological exercises. First, we established a prospective team composed of 13 stakeholders from the tennis sector and three from outside the field. Second, we applied prospective tools including a diagnosis of the present, an identity map, and a systemic map. The systemic map allowed us to identify the stakeholders and variables that initially intervened in this type of sports organization. Third, we implemented two additional prospective tools: the MACTOR method (structural analysis) and the MICMAC method (stakeholder dynamics). Finally, we conducted a retrospective analysis that enabled us to reach the study's conclusions.

With respect to professional, support, and administrative staff variables, Chun et al. (2022) indicated that sports organizations could determine targeted support strategies for employees, paying particular attention to stress-related situations to reduce burnout and high staff turnover. They also reported that

flexibility and adaptability contributed to the maintenance of solid relationships, which in turn supported improved performance among collaborators.

These results demonstrated the importance of this type of research and of identifying key variables and stakeholders for sports organizations, as such analyses provided a global understanding of how different elements behaved within organizational contexts and supported more assertive decision-making.

The study also identified several directions for future research. These included multicenter replication across tennis federations and other racquet sports to test the invariance of driver and link structures; longitudinal panel designs (12–24 months) linking scenario adoption to key performance indicators such as athlete retention, injury incidence, and revenue mix; quasi-experimental pilots of POS and well-being programs measuring burnout and turnover effects; cost–effectiveness analyses of digital technology stacks (tracking, analytics, and remote coaching); and agent-based simulations of stakeholder policies to explore cascade effects and tipping points.

Finally, although the confinement measures associated with the COVID-19 pandemic had negative effects on both the economy and public health, they also enabled the sports industry to reinvent itself, design new strategies, and innovate its processes and services. Murray et al. (2022) highlighted that collaboration among health, sports, and government organizations facilitated the successful development of sporting events using best scientific practices and available guidelines. In addition, the pandemic context accelerated the incorporation of digital elements, tools, and services into organizational offerings, as was evidenced by the results of this study.

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