# STUDY OF TRENDS IN THE SPORTS SECTOR

## SEGMENT: REFEREEING COMMUNITY

**Basketball • Football • Water polo • Handball • Rugby • Futsal • Volleyball • Hockey**

Active referees • Assistant referees • Match reporters • Refereeing committee coordinators

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# 1. THE IMPORTANCE OF MEASUREMENT IN ARBITRATION

Professional refereeing is undergoing an unprecedented transformation driven by the convergence of data analytics, computer vision and artificial intelligence. This study presents a comprehensive analysis of the current trends that are reshaping the paradigm of refereeing performance assessment.

| MARKET METRICS | 2025 | 2030 FORECAST | GROWTH |
|---|---|---|---|
| Global sports technology | 34.250 M$ | 68.700 M$ | 14,9% CAGR |
| Refereeing Technologies | 3.520 M$ | 16.060 M$ | 20,9% CAGR |
| AI in Sport | 1.200 M$ | — | 14,7% CAGR |

This exponential growth reflects the growing importance of objectifying refereeing decisions and the need for tools that facilitate both ongoing training and performance evaluation. Data modelling is emerging as the cornerstone for developing predictive systems that improve consistency and accuracy in refereeing.

# 2. METRICS TRENDS AND MODELLING

The modelling of refereeing data is based on the collection of objective metrics that enable the evaluation of decisions, positioning, reaction speed and consistency. The main categories of relevant metrics are set out below:

### Decision-making accuracy metrics

- Percentage of correct on-field decisions
- Average response time to game situations
- Consistency in applying the rules according to context

### Mobility and Location Metrics

- Distance covered during the match
- Coverage area of the pitch
- Optimal angle relative to the line of play

### Communication Metrics

- Effectiveness in signalling to players and teammates
- Time spent in the VAR review area
- Coordination with the refereeing team

# 3. HISTORICAL DEVELOPMENT OF ARBITRARY TRACKING

| AÑO | TECNOLOGÍA | APLICACIÓN |
|---|---|---|
| 2013 | SportVU (NBA) | Introducción de |
| 2019-2023 | Hawk-Eye (NBA) | Pose tracking c |
| 2023 | Partnership NBA-Sony | Sistema 3D en |
| 2024-2025 | Expansión europea | Aplicación en fú |
| 2026-2030 | Proyección | Adopción gener |

### IMPACT ON PROFESSIONAL ARBITRATION

Technological advances have enabled a shift from retrospective analysis using manual video reviews to real-time tracking systems that provide objective metrics on positioning and refereeing decisions. This transformation has brought about a paradigm shift in referee training, where decision-making can now be assessed quantitatively.

# 4. VIDEO ANALYSIS: A REVOLUTION WITHOUT WEARABLES

One of the most significant trends in refereeing analysis is the shift from systems based on wearables to computer vision solutions that do not require additional equipment for referees or players.

### Machine Vision Calibration Technology

1. **Automatic detection:** Deep learning models identify referees and players without markers.
2. **Pose tracking:** 2D/3D pose estimation without body-worn devices.
3. **Spatial reconstruction:** Homography and calibration to translate 2D positions into real-world coordinates.
4. **Kinematic analysis:** Speed, acceleration and movement patterns extracted without wearables.

### Practical Applications for Referees

- Real-time assessment of optimal positioning during matches
- Post-match analysis of viewing angles and coverage zones
- Physical fatigue metrics correlated with poor decision-making
- Simulation of continuous training scenarios

# 5. ARTIFICIAL INTELLIGENCE: DATA COLLECTION, PROCESSING AND PREDICTION

The integration of AI into refereeing analysis is evolving from description towards prediction and prescription, enabling us not only to document decisions but also to anticipate scenarios and generate automated recommendations.

| PHASE | AI FEATURES | BENEFIT |
|---|---|---|
| CAPTURE | Automatic event detection Severity classification Automatic report generation | Reduced analysis time<br>Objective categorisation |
| TREATMENT | Real-time processing Database comparison Pattern recognition | Support for immediate decision-making Continuous improvement based on data |
| FORECAST | Arbitration risk models Scenario simulation Automated recommendations | Prevention of excessive fatigue: Evidence-base training |

**KEY IMPACT METRICS**

- Up to a 40% reduction in non-contact injuries through early detection
- A 99.2% improvement in decision-making accuracy with VAR support
- A 35% reduction in review time through automatic analysis

# 6. CONCLUSIONS

1. Modelling as a foundation: The systematic collection of objective metrics forms the basis for any strategy to improve refereeing performance.
2. Computer vision vs. wearables: Visual calibration systems enable the collection of comparable data without the need for intrusive equipment for referees.
3. Predictive AI: The evolution towards prescriptive models enables the anticipation of risk scenarios and the optimisation of continuous training.
4. Strategic opportunity: The growth of the refereeing technology market (20.9% CAGR) represents a window of opportunity for early adoption.

# SOURCES CONSULTED


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- Strategic Market Research - AI in Sports Market Report 2024
- Global Market Insights - Sports Officiating Technologies Market 2024
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- PMC - Deep Learning Applications in Sports Performance Analysis
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