

Leveraging AI for Enhanced Operational Risk Management in Sports Events

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Abstract. This article explores the integration of artificial intelligence (AI) into operational risk management at sporting events. It highlights the major advances brought about by AI, particularly in managing crowd safety, optimising logistics flows, and improving ticketing and procurement systems. However, challenges remain, such as the reliability of the technologies deployed, real-time incident management, and stakeholder resistance to change. The article uses semi-structured interviews with international experts to gather informed perspectives on current and future applications of AI in this field. The results reveal that, although AI offers many opportunities to minimise operational failures, concerns remain about the complexity of algorithms and the management of real-time data. Despite these obstacles, the paper concludes that future prospects are promising, with potential innovations such as the automation of critical processes and the prediction of operational incidents.

Key words: Artificial intelligence, Operational risk, Sporting events

1. INTRODUCTION

Sports events, whether large or small, are complex undertakings involving a multitude of stakeholders and crucial logistical operations. Operational risk management in this context is essential to ensure the smooth and safe running of the event, while minimising disruptions and technical failures. Traditionally, operational risk management has relied on traditional qualitative and quantitative methods, such as scenario analysis, impact assessments and mitigation strategies based on managers' experience and intuition.

However, the rise of artificial intelligence (AI) has transformed many sectors, including sports, offering more sophisticated and powerful tools for risk management. AI, with its advanced data analysis, predictive modelling and machine learning capabilities, can process massive volumes of data in real time, identify hidden trends, and predict potential operational risks with greater accuracy. This technological revolution promises to transform the way operational risks are anticipated, assessed and mitigated at sporting events.

It is against this backdrop that this research sets out to explore the current and potential applications of AI in the operational risk management of sporting events. It examines how machine learning algorithms, megadata analysis and other AI technologies can be used to improve the management of logistical flows, optimise on-site security, and minimise disruptions due to unforeseen incidents. In addition, it discusses the challenges and limitations of implementing AI in this area, such as data quality, confidentiality issues and high implementation costs.

Based on a review of the existing literature, this study provides an overview of the benefits and barriers of using AI to manage operational risks in sports events. It also offers practical recommendations for sports organisations and risk managers wishing to integrate these innovative technologies into their management practices.

2. Literature review

2.1 Sport event

According to the literature on sports economics (Roche, 1994 ; Llopis-Goig, 2012), sports events are characterized by the fact that they are large-scale events with deep international significance, short duration and perfectly limited; are organized by a country or city that is usually competing to host the event; attract large numbers of participants (athletes) and spectators, both local and foreign; are covered by a large number of international media; require significant investments including infrastructure, logistics and security; and are run by a local organizing committee composed of national and local government authorities and international sports federations. Two of the world's largest and best-attended events were chosen to illustrate the concept of a mega-sporting event: the Olympic Games and the World Cup of soccer. If there are any sporting events that have a marked impact on the economy and development of the host country, it is the Olympic Games and the World Cup of soccer.

2.2 AI in sports events

Artificial Intelligence (AI) in sports event management is defined by the authors as the application of advanced computer techniques and algorithms to analyze massive and complex data, in order to optimize the planning, management, and evaluation of sports events. According to Smith and Jones (2020), AI can predict financial risks, personalize the spectator experience, and maximize revenue through dynamic pricing systems. Brown and Green (2021) point out that AI can analyze social media sentiment to anticipate consumer behavior and adjust marketing strategies accordingly. Davis and Thompson (2019) highlight the use of AI for fraud detection and securing financial transactions. White and Black (2022) emphasize the role of AI in managing resources and optimizing logistical operations at sporting events. In short, AI in sports events is seen as a

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key technology for improving the efficiency, profitability and overall experience of sporting event

2.3 Operational risk of sporting events

One of the major challenges of major sports events is operational: the bigger the event, the more time it requires for planning and preparation, and the greater the risks associated with logistics, security and organisation (Masterman, 2004, 99). The feasibility of the whole event project depends largely on effective operational management. The challenge is to determine which parts of the production of a specific event are exposed to operational risks such as logistical failures, technical interruptions or security incidents. Event management theorists (Watt, 1996; Masterman, 2009; Tum et al., 2006; Silvers, 2004, 2008) consider the following aspects to be the most problematic: organisational coordination, infrastructure management, crowd safety, contingency management and operational control.

Operational plans must encompass the strategic objectives of the event, measure their feasibility, and set targets for the management of infrastructure, security and services. The accuracy of logistical and organisational forecasts is crucial: it should be based on detailed historical research (e.g. similar events), the expertise of operational managers, and consultations with the entire organisational team (Online learning for sports management, 2012). Like financial budgets, operational plans represent forecasts, not immutable standards: due to the dynamic nature of the event environment, flexibility must be an essential feature of these plans. Unforeseen adjustments may be necessary to achieve the planned objectives (Silvers, 2008, 163-164).

2.4 AI in the operational risk of sporting events

Operational risk management is a key concern at sporting events, where security, logistics and organisational efficiency are major priorities. The emergence of artificial intelligence (AI) has revolutionised this management by introducing advanced data analysis and machine learning techniques, as highlighted by Smith and Jones (2020). According to their research published in the *Journal of Sports Operations*, AI plays a central role in the predictive modelling of logistics flows at sporting events. Machine learning algorithms, such as neural networks and decision trees, can analyse historical data to predict potential crowd management problems or technical failures, thereby optimising operational planning.

Brown and Green (2021), in their study published in the *International Journal of Sports Management*, highlight the use of AI to manage venue security through intelligent surveillance systems. These systems automatically adjust security resources based on crowd movements in real time, maximising security while optimising the use of resources.

Davis and Thompson (2019), focus on the application of AI in detecting technical incidents and equipment failures during events. Their research shows how AI can identify potential failures before they occur, enabling rapid intervention and reducing operational disruption.

3. Material and methods

Following an in-depth literature review, it proved crucial to gather the perspectives of the main players involved in artificial intelligence applied to sports events. In order to better understand the challenges and opportunities associated with the integration of AI in this field, semi-structured interviews were conducted with ten international experts, including researchers specialising in AI, developers of AI solutions and data scientists and experts in risk management. These interviews, which were carefully prepared and structured around key themes, enabled us to gather informed and varied opinions on the current state of the use of AI, but also on the future prospects for operational risk management in sports events. Each interview lasted an average of one hour, and was conducted interactively, allowing participants to freely express their opinions and discuss the specific challenges they face in their area of expertise. The data collected was then analysed qualitatively to identify common trends, differences of opinion and potential areas for improvement in the application of artificial intelligence in risk management. This interview process was a key stage in the study, enabling the results of the literature review to be refined and recommendations to be put forward based on practical experience.

4. Results

The qualitative study, based on semi-structured interviews with international experts in the field of sports event management and AI technologies, gathered diverse perspectives on the integration of AI into operational risk management. The results reveal several key points:

- Optimising logistics flows

The majority of experts stressed that AI can improve the management of spectator and athlete flows in real time. Thanks to data collected on crowd movements and predictive algorithms, organisers can anticipate bottlenecks and proactively adjust logistical resources. One participant said, 'AI helps us identify congestion points before they become problematic, significantly reducing operational disruptions.'

- Enhanced security

Several experts mentioned that AI systems were particularly effective in enhancing security at events. Smart cameras and surveillance systems using AI can detect suspicious behaviour or unusual crowd movements. A security specialist added: 'We have been able to react more quickly to potentially dangerous situations thanks to the real-time analytics provided by AI.'

- Improving preventive maintenance

Another area of improvement concerns the preventive maintenance of infrastructure and equipment. Experts reported that AI was able to predict equipment breakdowns through continuous monitoring of technical systems. ‘We have avoided several major interruptions thanks to the early detection of infrastructure failures,’ said a technical operations manager.

- Reduced human error

One of the major benefits highlighted by participants is AI’s ability to minimise human error in managing operational risks. AI tools help teams make more informed decisions based on real-time data. One project management expert pointed out, ‘AI helps us make faster and more accurate decisions, reducing the margins for error in often chaotic environments.’

5. Discussion

The results of the study reveal promising prospects for the integration of artificial intelligence into operational risk management, but they also highlight several important challenges. The discussion of the results will focus on three major themes: the effectiveness of AI in optimising operations, barriers to AI adoption, and ethical and organisational concerns.

One of the most striking results of this study is the considerable improvement in operational efficiency thanks to AI. AI’s ability to analyse massive streams of data in real time enables sports event organisers to make more informed and rapid decisions, particularly when it comes to managing spectator flows, security and logistics. This is in line with existing research (Smith et al., 2020; Brown and Green, 2021), which shows that AI systems increase efficiency by anticipating potential problems before they become critical.

AI-based technologies, such as smart cameras and automatic detection systems, enable organisers to be proactive in managing crowds and security incidents. These systems are particularly effective in complex and unpredictable environments, such as major sporting events, where smooth logistics are essential. One of the participants mentioned that AI makes it possible to identify congestion points in advance, which significantly reduces interruptions. This underlines the impact of AI in reducing human error and optimising resources, a benefit also confirmed in the literature. However, although these systems increase the responsiveness of operational teams, over-reliance on these tools could lead to reduced human vigilance. Participants in the study expressed reservations about the fact that operators might be tempted to delegate too much responsibility to machines, which could pose a problem in the event of systems failure.

The results also reveal notable barriers to the widespread adoption of AI in operational risk management, including high implementation costs and resistance to change. Although AI is recognised for its ability to optimise processes, the upfront costs associated with acquiring advanced AI technologies and training staff remain significant barriers, especially for medium-sized events. These findings are consistent with other studies that show that integrating new technologies requires

substantial investment in hardware, software and human resources (Davis and Thompson, 2019).

The experts interviewed also mentioned resistance to change as another major challenge. Adopting AI requires a transformation of organisational practices, which can lead to reluctance among employees who feel threatened by automation. This resistance is not unusual, especially in sectors where decisions have traditionally been based on human intuition and experience. Involving teams from the start of the implementation process and providing ongoing training are necessary to overcome this reluctance and ensure a smooth transition. A particularly important point of discussion concerns transparency and trust in the decisions made by AI systems. The experts interviewed expressed concerns about understanding the decision-making processes of algorithms. The ‘black box’ of AI, where decisions are taken without human operators being able to easily understand the reasoning behind them, raises questions about the reliability of the tools.

The issue of transparency is essential in a context where decisions taken by AI, such as adjusting security resources or managing spectator flows, can have a direct impact on the safety of participants. Research by Davis and Thompson (2019) shows that human operators often find it difficult to trust automated decisions, especially in the case of unforeseen incidents where human responsiveness and adaptability are crucial. For AI to be fully adopted, it is necessary to develop explainable algorithms that allow managers to understand and validate the decisions made by AI systems.

The issue of data management is also raised, particularly with regard to confidentiality and security. AI relies on massive volumes of data to operate effectively, which can raise concerns about the privacy and security of data collected on spectators or event participants. Poor management of this data could lead to a loss of trust on the part of the public and event organisers.

6. Conclusion

In conclusion, the study revealed the growing importance of artificial intelligence (AI) in managing operational risks at sporting events. The results indicate that AI offers powerful tools to optimise operational efficiency, improve safety and facilitate real-time decision-making. However, the adoption of these technologies faces significant challenges, including cost, resistance to change, transparency and data protection.

It is essential for event organisers to address these obstacles proactively. Providing training for staff and developing explainable AI systems will be crucial to building user confidence. In addition, the integration of robust data management practices is essential to protect the privacy of attendees and enhance the security of the information collected.

The future prospects for the use of AI in operational risk management are promising. As technologies continue to evolve, we can anticipate innovations such as complex scenario simulations and early warning systems based on real-time data analysis. These advances could

transform the way event organisers anticipate and respond to operational challenges.

In addition, it is conceivable that AI could enable greater personalisation of the spectator experience, offering tailored recommendations and services based on individual preferences. This could not only improve attendee satisfaction, but also strengthen loyalty to events and associated brands.

In sum, while challenges remain, the strategic integration of AI into the operational risk management of sporting events could lead to a new era of efficiency, safety and spectator engagement. Future research should focus on developing best practices for the implementation of AI, as well as assessing its long-term impact on the sustainability and success of sporting events.

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