

Chapter 12

Artificial Intelligence (AI): A New Tool for Energy Control in Sport

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ABSTRACT

Digital transformation has become the top priority for 80% of sports companies worldwide, but statistics show that between 70 and 95% of all digital transformation projects fail due to the significant and varied challenges that sports businesses face during the digital transformation process. This is because strategy, not digital technology, drives digital transformation, and without a mature digital transformation model, success is unlikely. This chapter explores the transformative role of Artificial Intelligence (AI) in energy management within sports environments. As modern sports stadiums face increasing energy demands due to advanced technologies and large-scale operations, AI emerges as a pivotal solution for optimizing energy control. The chapter examines how AI tools, such as predictive analytics, machine learning, and real-time monitoring, contribute to energy-efficient practices. These tools enable smart management of lighting, HVAC systems, and other energy-consuming components in stadiums, leading to reduced operational costs and enhanced sustainability. Additionally, AI-driven technologies offer insights into athletes' energy consumption, allowing for tailored training regimes that enhance performance while minimizing waste. Through various case studies, including the integration of AI in major events like the Olympic Games, the chapter highlights the potential for AI to revolutionize energy consumption in sports venues, contributing to a more sustainable and technologically advanced future in sports management.

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1: INTRODUCTION

Energy consumption has emerged as one of the major challenges confronting societies today. This is attributed to the depletion of some energy resources and the fact that energy losses not only escalate costs but can also lead to various associated problems. The issue of energy limitation is increasingly becoming an acute crisis globally, shaping many economic and political relationships. Economic growth, which serves as a prerequisite for industrial independence, cultural prosperity, and political authority, depends on various factors, including energy and the optimal use of its resources. Effective energy management in sports facilities leads to improved efficiency and performance of athletes (Smith, 2000). With the increasing number of sporting events and the crowds present in these venues, the need for optimizing energy consumption and reducing costs is felt more than ever.

Digital transformation has become the top priority for 80% of sports companies worldwide, but statistics show that between 70 and 95% of all digital transformation projects fail due to the significant and varied challenges that sports businesses face during the digital transformation process. This is because strategy, not digital technology, drives digital transformation, and without a mature digital transformation model, success is unlikely. Moreover, the digital transformation model of developing and developed countries is not the same, and it cannot be adopted as a blueprint (Mohammadi et al., 2023). Artificial Intelligence (AI) has rapidly transformed various industries, and its influence in the sports sector is no exception (Pashaie & Nasirpour, 2024). With the increasing demand for optimizing athletic performance and managing energy expenditure, AI has emerged as a powerful tool in transforming how athletes train, compete, and recover. AI, as a novel tool, enables the analysis of data and the prediction of energy consumption patterns, which can lead to more efficient management of energy resources in stadiums. The use of artificial intelligence algorithms in energy control and management allows stadiums to monitor and adjust their energy consumption intelligently and in real-time. This technology can provide optimized strategies for reducing energy consumption and enhancing efficiency by analysing data related to traffic patterns, weather conditions, and spectator behaviour.

Traditionally, energy management in sports has relied on human expertise, intuition, and basic physiological measurements. However, with the advent of AI, there is a significant shift toward using data-driven insights to maximize efficiency. AI-driven tools can analyse vast amounts of data collected from wearable devices, sensors, and biometric systems to provide precise feedback on an athlete's energy levels, movement patterns, and overall performance. This has enabled coaches and sports professionals to make more informed decisions and adjust strategies to improve outcomes.

In addition to performance enhancement, AI has the potential to minimize energy waste, prevent injuries, and extend athletes' careers by ensuring they are training and competing within their optimal energy thresholds. With personalized recommendations, AI systems can help athletes balance the fine line between peak performance and overexertion, leading to more sustainable and effective approaches to energy control in sports. This chapter explores the innovative role of AI in controlling energy in sports, focusing on how advanced technologies can monitor, predict, and enhance athletic performance by providing real-time data analysis, precision monitoring, and customized training plans.

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