Transformative Potential: A Brief Overview of the Advantages of Artificial Intelligence in Maintenance Management

Hugo Madeira Cardoso[1]

Artificial Intelligence (AI) is undoubtedly a central theme in contemporary discussions, standing out for its growing relevance. This increased significance reflects not only the interest in developing machines capable of mimicking human behavior but also the evident or subtle presence of this technology in our daily lives, such as virtual assistants, email applications, social networks, and streaming platforms.

Given the growing importance of maintenance management for organizations, driven by factors like competitiveness in various markets, the complexity of compliance with legislation, and, especially, the increasing focus on sustainability and social responsibility by companies, a significant increase in technological investments in this area is natural.

In this context, AI emerges as a key element in asset lifecycle management. This article aims to highlight some of the advantages that the incorporation of AI into the maintenance management process can provide to organizations.

1. Predictive Maintenance

The incorporation of advanced monitoring systems for crucial operational parameters, such as temperature, pressure, and vibrations, proves indispensable in the efficient management of assets. Through the implementation of AI algorithms, these systems play a vital role in the early identification of signals indicating wear or declining equipment performance, enabling proactive decision-making regarding maintenance, anticipating potential failures. Known as predictive maintenance, this strategy stands out as an essential element in optimizing industrial processes, ensuring greater equipment availability, and simultaneously contributing to the safety of people and facilities by reducing the likelihood of catastrophic failures.

Implementing predictive maintenance as an organization's maintenance strategy will significantly reduce the reactive approach to maintenance actions. According to Cabral [1], reactive work costs three to four times more than planned work. Planning maintenance actions allows for better resource allocation, reducing the likelihood of unforeseen unavailability and ultimately achieving a reduction in maintenance costs. Additionally, this approach, integrated within the scope of preventive maintenance, helps mitigate the risks of significant breakdowns that could impact asset performance or, in certain cases, compromise the safety of people, facilities, or the environment.

2. Optimized Resource Allocation

AI algorithms play a crucial role in optimizing the allocation of resources for maintenance activities. These algorithms consider essential information such as equipment criticality, its failure history, the specific nature of the intervention (electrical, mechanical, etc.), and technician availability. The expected result is an optimized scheduling of maintenance actions, providing more efficient resource management and improving the operational performance of maintenance.

With this achievement, organizations can anticipate an increase in the productivity of maintenance teams, as tasks are assigned based on the skills and availability of maintenance technicians, consequently reducing the resolution time for repair requests.

3. Automated Management

The automation of maintenance intervention management is one of the processes that can be optimized through AI tools. In the management context, the ability to create and assign work orders to technicians automatically stands out, allowing human capabilities to focus on more relevant tasks, such as decision-making based on collected data. Thus, repetitive tasks, as mentioned earlier, are automated, contributing to a more efficient management of maintenance operations.

[1] **Hugo Madeira Cardoso**, Navaltik Management, Lda. (email: hcardoso@manwinwin.com)

December 2023

Additionally, AI-powered tools play a crucial role as assistants in maintenance management. Through real-time analysis of information, these applications provide immediate support to users through notifications of specific events, such as equipment unavailability, scheduled preventive maintenance without the necessary materials in stock, recurring breakdowns, among others. Moreover, they present suggestions resulting from the analysis, such as updating preventive maintenance periodicities or possible equipment replacements.

4. Decision Support

Undoubtedly, one of the great advantages that organizations will achieve with the implementation of AI in maintenance management is the abundance of collected data and the information processing capacity. Decision-making will be based on data, enabling more informed decisions based on historical records related to equipment replacement, material inventory management, and process optimization, among others. Continuous technological progress, combined with the growing importance of maintenance management for organizations, will lead to the widespread use of AI-based model tools. The integration of these platforms allows for a proactive approach to maintenance management. The implementation of predictive maintenance strategies, optimization of resource allocation, automated management, and decision support are just a few of the achievable advantages with the application of AI-based solutions.

However, despite the practically unlimited potential of using AI in maintenance management, its implementation requires detailed planning and the acquisition of large quantities of high-quality data so that the analysis result aligns with reality. Considering the evolution these tools have undergone in recent years, it is emphasized that they should be regarded as management support platforms, not as substitutes for human cognitive and critical capabilities.

REFERENCES

[1] Cabral, J. P. S. (coord.) (2021). Gestão da Manutenção de Equipamentos, Instalações e Edifícios. Lisboa: Lidel.