



Towards performance in aeronautics: the role of artificial intelligence.

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ABSTRACT

AI integration is growing interest in the aeronautics sector. Common AI technologies include autonomous intelligent systems, predictive analytics and machine learning. The benefits of AI integration include cost reduction, improved customer satisfaction, time savings, enhanced safety and security, better decision-making, problem-solving, and operational efficiency. By implementing new AI technologies aeronautics companies enhance their performance.

Keywords: Artificial Intelligence, Use Cases, Aeronautics, Performance, Benefits.

I. INTRODUCTION

Aeronautics has realized significant developments in recent years driven by a focus on performance. To some extent, this trend was enabled by digital technologies (DT), especially artificial intelligence (AI). AI has the potential to improve performance by enabling autonomous systems, optimizing operations, and improving decision-making processes. AI algorithms are adept at treating large volumes of data, decrypting complex patterns, and making real-time intelligent decisions. The adoption of artificial intelligence (AI) in various sectors has increased significantly in recent years (Haenlein & Kaplan, 2019; Russell, 2022). In the aeronautics industry, AI is being used to address complex challenges such as improving flight operations and safety, fuel costs, environmental impacts and customer demand.

I. ARTIFICIAL INTELLIGENCE

Artificial Intelligence was introduced in 1956 and various definitions of AI were provided by influential figures in the field. In recent years, AI has included advancements in computer vision, augmented and virtual reality, big data analysis, predictive maintenance, machine learning, and autonomous systems in the industrial value chain (McCarthy et al., 2006).

AI techniques can be divided into two groups: symbolic AI techniques and data-driven (numeric) AI techniques. Symbolic

AI techniques rely on rules and inferential logic to generate new knowledge, while data-driven AI techniques analyze historical data to generate new knowledge, such as predictions and classifications. Applications of AI include computer vision and autonomous intelligent systems, which can use both numerical and symbolic AI. Analytical perspectives such as descriptive, predictive, and prescriptive analytics can also use both types of AI. Numerical AI includes Machine Learning (ML) and Deep Learning (DL) (Fosso Wamba et al., 2022; Kamsu-Foguem et al., 2023).

According to Zaoui et al. (2024), the 100 use cases collected from aeronautical companies have allowed the authors to analyze the use of AI technologies. The most recurrent AI applications found in the 100 use cases include machine learning, predictive analytics and computer vision.

II. PERFORMANCE

The potential influence of AI on operations management, production planning and control, productivity, and performance is incredibly significant. In production systems activities, AI is crucial for enhancing performance and facilitating the organization's journey to business value (Fosso Wamba et al., 2022).

The aeronautical field is increasingly using AI to solve complex problems, improve performance, and enhance safety. AI technologies are being applied in various areas such as production, maintenance, and supply chain. Also, airlines are exploring AI applications to improve customer satisfaction, smart logistics and facial recognition to ease the process of traveling. In production systems activities, AI plays a critical role in the improvement of performance and in supporting an entire journey to business value creation. The use of AI in aerospace manufacturing is leading to the development of new technologies for automation and process optimization for example in final assembly lines.

Many benefits are emerged by adopting AI in aeronautics. For example, predicting and saving time for developers and operators, augmented reality for assembly and maintenance

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efficiency. Also, tangible and intangible benefits such as inventory savings and improved product quality are mostly common. AI can deliver benefits in areas like better decision-making, time-saving, customer satisfaction, safety, efficiency, optimization, cost reduction, and problem-solving. In the field of aeronautics, AI plays a critical role in performance improvement and business value creation, many companies focused on responding to customer needs during the COVID-19 pandemic, aiming for efficiency, customer satisfaction, product quality, and supply chain improvement. (Zaoui et al., 2024).

According to Clainche et al. (2023), Machine learning has the potential to enhance aircraft performance. For example, the integration of Machine learning into the design and optimization of aircraft components and systems is crucial for improving aerodynamic aircraft performance using an ML approach.

III. DISCUSSION

A. Theoretical implications

AI development is important in the aeronautics industry, as it represents a major field. AI technologies can facilitate tasks and improve efficiency, quality, and effectiveness. The conceptualization enables the design of a standard-based architectural model, which facilitates the conception of systems such as smart manufacturing systems by ensuring a solid product cycle structure across all levels (vertical, horizontal, and end-to-end). (Cañas et al., 2022).

B. Practical implications

AI is driving the development of future technologies in the aeronautics industry, transforming manual tasks into innovative autonomous systems and enhancing overall performance. It provides valuable insights for industrial executives, practitioners, and researchers, serving as a useful resource for further studies. AI can help in strategic decision-making, reducing operational costs, and improving marketing effectiveness. Overall, AI can help improve business performance and lead to new products and services in the aeronautics sector.

IV. CONCLUSION

Aeronautics companies face many challenges to develop new technologies. Many competences within organizations are developing new tools and methods to optimize production, cutting costs, and improving performance with AI. The biggest companies in aeronautics are interested in AI technologies such as machine learning and computer vision

techniques. The use of AI impacts performance in industrial, economic, and market fields.

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