**Perspective**
Volume 15:06, 2024

Business and Economics Journal

ISSN: 2151-6219

Open Access

# The Impact of Artificial Intelligence on Engineering Management Decision-making: The Mediating Role of Transformational Leadership

**Adam Chikerema***

*Department of Engineering Management, Auckland University of Technology, Auckland, New Zealand*

## Introduction

Artificial intelligence has emerged as a transformative force in engineering management, reshaping decision-making processes across industries. By leveraging machine learning, predictive analytics, and data-driven insights, AI has enhanced the ability of managers to make informed, efficient, and forward-thinking decisions. In engineering management, where complexity, uncertainty, and rapid technological changes define the landscape, AI offers tools to optimize processes, improve resource allocation, and foster innovation. However, the integration of AI into decision-making processes is not solely a technological matter; it is deeply influenced by leadership styles, particularly transformational leadership. This leadership approach plays a mediating role in aligning AI capabilities with organizational goals, fostering trust, and driving effective adoption within engineering teams. AI's ability to process vast amounts of data and generate actionable insights fundamentally changes how decisions are made in engineering management. Traditional decision-making often relies on human judgment, intuition, and experience, which, while valuable, are prone to biases and limitations. AI mitigates these challenges by analyzing complex datasets, identifying patterns, and predicting outcomes with high precision. For instance, in project management, AI can evaluate historical data to estimate timelines, budgets, and risks, enabling managers to allocate resources more effectively and anticipate potential obstacles. Similarly, in maintenance and operations, AI-powered predictive analytics can monitor equipment performance, identify anomalies, and recommend preventive measures, reducing downtime and costs [1].

Despite its advantages, the adoption of AI in engineering management is not without challenges. AI systems require significant investment in technology, infrastructure, and expertise, which can strain organizational resources. Furthermore, the reliance on AI for critical decision-making raises concerns about trust, accountability, and the potential displacement of human judgment. These challenges underscore the need for effective leadership to navigate the complexities of integrating AI into engineering management practices. Transformational leadership, characterized by vision, inspiration, and a focus on individual and team development, plays a crucial role in addressing these challenges. Transformational leaders are adept at articulating a compelling vision for the future, motivating employees to embrace change, and fostering a culture of innovation and collaboration. In the context of AI adoption, transformational leadership can bridge the gap between technology and human factors, ensuring that AI enhances rather than undermines decision-making processes [2].

## Description

***Address for Correspondence:** Adam Chikerema, Department of Engineering Management, Auckland University of Technology, Auckland, New Zealand, E-mail: adamhikerema@dem.nz*



**Received:** 02 December, 2024, Manuscript No. bej-24-156825; **Editor Assigned:** 04 December, 2024, PreQC No. P-156825; **Reviewed:** 18 December, 2024, QC No. Q-156825; **Revised:** 23 December, 2024, Manuscript No. R-156825; **Published:** 30 December, 2024, DOI: 10.37421/2151-6219.2024.15.531

One of the key contributions of transformational leadership to AI-driven decision-making is building trust in AI systems. Employees may initially be skeptical or resistant to AI due to concerns about job security, lack of understanding, or fear of losing control over decisions. Transformational leaders can alleviate these concerns by communicating the benefits of AI, providing training and support, and demonstrating its alignment with organizational values and goals. By fostering an open and inclusive environment, these leaders encourage employees to engage with AI systems, experiment with new tools, and integrate AI insights into their workflows. Transformational leaders also play a critical role in ensuring ethical and responsible use of AI in engineering management. The deployment of AI raises ethical questions related to bias, transparency, and accountability. For example, AI algorithms trained on biased data can perpetuate unfair practices or lead to suboptimal decisions. Transformational leaders, with their emphasis on values and integrity, can establish guidelines for ethical AI use, promote diversity and inclusivity in AI development, and ensure that AI-driven decisions align with organizational principles and societal expectations. By addressing these ethical concerns, leaders not only enhance trust in AI systems but also protect the organization's reputation and long-term sustainability [3].

Another way transformational leadership mediates the impact of AI on decision-making is by fostering a culture of continuous learning and adaptability. AI technologies evolve rapidly, requiring organizations to stay updated with the latest advancements and adapt their practices accordingly. Transformational leaders inspire their teams to embrace lifelong learning, experiment with new approaches, and remain agile in the face of change. For instance, they may encourage employees to participate in AI training programs, collaborate with external experts, or engage in cross-disciplinary projects that leverage AI capabilities. This proactive approach ensures that engineering teams remain competitive and resilient in a dynamic technological landscape. Moreover, transformational leadership enhances the human-AI collaboration necessary for effective decision-making in engineering management. While AI excels at processing data and generating insights, human judgment remains critical for interpreting these insights, addressing ambiguities, and making context-sensitive decisions. Transformational leaders empower employees to combine their expertise with AI-generated recommendations, creating a synergy that maximizes the strengths of both human and machine intelligence. This collaborative approach not only improves decision quality but also enhances employee satisfaction and engagement, as team members feel valued for their contributions [4].

In engineering management, where decision-making often involves balancing technical, financial, and organizational considerations, transformational leadership can facilitate the integration of AI into complex decision-making frameworks. For example, in product development, AI can optimize design processes by analyzing customer preferences, market trends, and technical constraints. Transformational leaders can guide teams in leveraging these insights to innovate and create value while addressing potential trade-offs and ensuring alignment with strategic objectives. Similarly, in supply chain management, AI can enhance decision-making by forecasting demand, identifying risks, and optimizing logistics. Transformational leaders can enable teams to use these capabilities to improve efficiency, reduce costs, and enhance customer satisfaction.

The role of transformational leadership extends beyond individual teams or projects, influencing organizational culture and strategy. Transformational leaders advocate for a forward-looking approach that positions AI as a

strategic asset rather than a mere operational tool. They encourage cross-functional collaboration, knowledge sharing, and the integration of AI across different levels of the organization. For instance, they may initiate AI-driven initiatives in areas such as sustainability, risk management, or innovation, demonstrating the broader potential of AI to drive organizational growth and resilience. By embedding AI into the organizational fabric, transformational leaders ensure that engineering management decisions are informed by data, aligned with long-term goals, and responsive to emerging challenges and opportunities. In the context of emerging markets, where resource constraints and infrastructural challenges may hinder AI adoption, transformational leadership becomes even more critical. Leaders in these regions must navigate unique barriers such as limited access to technology, skill gaps, and regulatory complexities. Transformational leaders can mobilize resources, build partnerships, and advocate for supportive policies to overcome these obstacles. For example, they may collaborate with academic institutions, government agencies, or technology providers to develop AI capabilities and drive innovation in engineering management. By leveraging their vision and influence, these leaders can position their organizations at the forefront of technological transformation, unlocking new opportunities and competitive advantages [5].

The mediating role of transformational leadership in AI-driven decision-making also has implications for leadership development and succession planning. As AI becomes integral to engineering management, organizations must cultivate leaders who possess both technical proficiency and the ability to inspire and guide teams through change. Leadership development programs should emphasize skills such as strategic thinking, emotional intelligence, and ethical decision-making, preparing future leaders to navigate the complexities of AI integration. By fostering a pipeline of transformational leaders, organizations can ensure the sustained impact of AI on engineering management and maintain a competitive edge in an increasingly technology-driven world.

## Conclusion

AI is revolutionizing decision-making in engineering management by providing powerful tools for data analysis, process optimization, and predictive insights. However, the successful integration of AI into these processes depends not only on technological capabilities but also on effective leadership. Transformational leadership plays a pivotal role in mediating the impact of AI, fostering trust, ethical responsibility, and human-AI collaboration. By aligning AI capabilities with organizational goals and values, transformational leaders enable engineering teams to harness the full potential of AI while navigating the challenges and uncertainties of technological change. This synergy between AI and transformational leadership paves the way for more informed, innovative, and impactful decision-making in engineering management, driving progress and resilience in an era defined by rapid technological evolution.

## Acknowledgement

None.

## Conflict of Interest

None.

## References

1. Divya Divya, Riya Jain, Priya Chetty and Vikash Siwach, et al. "The mediating effect of leadership in artificial intelligence success for employee-engagement." *MANAGE DECIS* (2024).
2. Matsunaga, Masaki. "Uncertainty management, transformational leadership, and job performance in an AI-powered organizational context." *Commun Monogr* 89 (2022): 118-139.
3. Dhamija, Ankit, and Niti Chatterji. "Artificial intelligence: The missing link between leadership and knowledge management." *Digi Trans Global Modern Corp (*2021).
4. Ahmadi Mohsen, Mohammad Reza Ardalan, Siroos Ghanbari and Afshin Afzali. "Investigating the Role of Digital Leadership and Technology Flexibility in Intelligent Decision-Making with the Mediation of Intellectual Ethics and Team Reception." *Sch Admin* 11 (2023): 24-55.
5. Sharma Rajesh Kumar, Sukhpreet Kaur and Amit Mittal. "Role of transformational leadership in implementation of Education 4.0: A parallel mediation model in context of higher educational institutions (HEIs)." *GKMC* (2024).

**How to cite this article:** Chikerema, Adam. “The Impact of Artificial Intelligence on Engineering Management Decision-making: The Mediating Role of Transformational Leadership.” *Bus Econ J* 15 (2024): 531.