

Transforming for Sustainability: Total Quality Management and Industry 4.0 Integration with a Dynamic Capability View

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Abstract

Integrating Total Quality Management (TQM) and Industry 4.0 technologies has gained attention as a promising approach for firms seeking to improve their operational efficiency and sustainability performance. This research conducted a systematic literature review (SLR) to examine the integration of TQM and Industry 4.0 technologies to achieve sustainability through the lens of dynamic capabilities. The literature analysis identified six main drivers and barriers: organizational culture, leadership commitment, technology infrastructure, employee training, data management, and cybersecurity. The findings revealed that the adoption of Industry 4.0 technologies has a positive impact on the implementation of TQM and sustainability performance in manufacturing organizations. The results also indicate that the adoption of Industry 4.0 technologies and features is influenced by drivers such as strategic objectives and external pressures. In contrast, barriers such as limited resources and technology compatibility hinder the adoption process. The research presents a theoretical proposition emphasising adopting a dynamic capability view in TQM and Industry 4.0 integration for sustainable performance. Furthermore, the proposed theoretical framework highlights that integrating TQM and Industry 4.0 technologies positively affects sustainability performance, particularly in the economic and environmental dimensions. Recommendations for organizations seeking to integrate TQM and Industry 4.0 technologies include prioritizing organizational culture and leadership commitment, providing employee training, effective data management, and robust cybersecurity measures. Overall, this research contributes to understanding how TQM and Industry 4.0 integration can enhance sustainability performance through the lens of dynamic capabilities.

Keywords

Total Quality Management, Industry 4.0, Sustainability Performance, Dynamic Capabilities.

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Biographies

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Cristóvão Silva is a Professor at the Department of Mechanical Engineering of the University of Coimbra, Prof Silva completed his PhD in Mechanical Engineering - Specialty Control and Management in 2000 by the University of Coimbra, master's in mechanical engineering sciences in 1995 by the University of Coimbra and Licentiate in Mechanical Engineering - Production Branch in 1992 by the University of Coimbra.

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