

Assessing the Synergies and misalignments between Lean and Industry 4.0 practices in today's manufacturing shop-floors

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Abstract

This study examines the main Industry 4.0 technologies that, according to the literature, might reinforce the capacity of lean manufacturing (LM) to improve plant performance. Moving away from the existing studies that typically handle this question at a high level, we opted for a fuzzy-set qualitative comparative analysis (fsQCA), which enables multiple antecedents and their combinations to be identified to determine the outcome. Necessary data were obtained from a multisector sample of 568 manufacturing plants (NACE codes 15–37) from six European countries. The results support the argument that different causal paths among LM and Industry 4.0 improve plant performance; however, contrary to the initial expectations, the findings revealed that Industry 4.0 technologies (specifically digital technologies and additive manufacturing) seem to be, by themselves, sufficient conditions that can improve the results. In fact, in contrast to conventional lean wisdom, the findings suggest that in 4.0 technology-intensive shop floors, certain lean practices, those conceived for high volume-low variety (HVLV) manufacturing systems, might be counterproductive.

Keywords

Lean manufacturing, Industry 4.0, Digital technologies, Additive manufacturing, European Manufacturing Survey

Biographies

Antonio Sartal is currently a Postdoc researcher in the Department of Mechanical and Industrial Engineering (DEMI) at New University of Lisbon (Portugal) and the University of Vigo (Spain). He managed the Department of R&D of a food multinational for the past ten years, until he recently joined a research team working on technology management and organizational innovation. His research interests include the intersection of lean thinking, innovation management, and information technologies. He has published 13 articles in JCR international journals such as Supply Chain Management: An International Journal, Computer and Operations Research and IEEE Transactions On Engineering Management, among others.

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