

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

Antonio Sartal

Faculdade de Ciencias e Tecnologia, Universidade Nova de Lisboa,
Campus Universitario, Caparica 2829-516, Portugal
antoniosartal@uvigo.es

Josep Llach

Mechanical and Industrial Engineering Department
Campus de Montilivi, 17071 Girona
josep.llach@udg.edu

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

Biography / 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.

Josep Llach is lecturer in the Universitat de Girona (Spain). He holds an Industrial Engineering degree and a PhD in Innovation Management. Nowadays, he is teaching and researching in the department of Organització, Gestió Empresarial i Disseny de Producte. Josep Llach has published more than 30 articles in JCR international journals. His research interest includes innovation management, with a particular emphasis on organizational innovation.