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EDITED AND REVIEWED BY
Irene Buj-Corral,
Universitat Politecnica de Catalunya, Spain

*CORRESPONDENCE
Dimitris Kiritsis,
dimitris.kiritsis@epfl.ch

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Editorial: Horizons in manufacturing technology

Dimitris Kiritsis*

Swiss Federal Institute of Technology Lausanne, Lausanne, Switzerland

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Editorial on the Research Topic
Horizons in manufacturing technology

During the last few years we are observing a continuous progress of Manufacturing driven by new emerging technological innovations which allow to reinforce sustainable and resilient growth. In order for this progress of the manufacturing industry to be sustained and reach more end-users, create new jobs and align with the Circular Economy paradigm, the following challenges need to be addressed in order to cover the needs for Sustainable & Resilient Value Chains:

- Integrating value chain perspective with systems thinking and product circularity design.
- Rethinking the global supply chain model with traceability and responsibility at the core.
- Understanding what technologies and data will drive value creation in industrial organization.
- Opening the mystery box of Internet of Things, Industrial AI, digital twins & data interoperability.
- Initiating and guiding connected and dynamic operations transformations across stakeholders.
- Driving implementation of collaborative digital platforms for planning, manufacturing & logistics.
- Reallocating skills of the workforce to cover the needs for competencies in key Research Topic of Sustainability & Resilience of Value Chains and the Enabling Technologies of the 4th Industrial Revolution.

In this Research Topic, we present a compilation of four papers presenting and demonstrating results of recent research and innovation activity in a variety of Research Topic within Manufacturing Technology.

The first paper, "Resilience Analysis of Additive Manufacturing-enabled Supply Chains: An Exploratory Study" by Patel et al., presents a framework to quantitatively measure the resilience of Additive Manufacturing (AM) Supply Chains (SC). The framework is designed to calculate resilience scores for alternative SC configurations and to provide a clear ranking based on the performance scores. The framework utilizes carefully selected Supply Chain Resilience indices based on the criteria of objective quantifiability and AM relevance.

In the second paper, "A Semantic Ontology-Based Approach to Support Model-Based Systems Engineering Design for an Aircraft Prognostic Health Management System" by

Chen et al., a case study of an aircraft fuel Prognostic Health Management (PHM) system is carried out to validate the proposed method. Based on the developed meta-model library, a complete MBSE design process for the aircraft PHM system is realized. Then, an ontology model supporting PHM system design is generated from the semantic Model Based Systems Engineering (MBSE) model. The MBSE ontology provides a shareable capability to help designers communicate effectively. Quantitative analysis based on ontology is also provided to verify the complexity and scale of the MBSE design process. Moreover, logical reasoning ability can also be provided to support the early requirement traceability for MBSE design. In general, the case study results show the feasibility and effectiveness of the proposed method for the aircraft PHM system design.

The third paper, "Identifying and Assessing the Required I4.0 Skills for Manufacturing Companies' Workforce" by Acerbi et al., contributes to the scientific literature by covering the preliminary gap identified about the necessity to have an updated view over the job profiles and the related needed skills requested in smart factories employing I4.0 technologies. Also, the study presented in this paper contributes to the development of a comprehensive, customizable and objective assessment model for skills in the I4.0 environment, to support the evaluation of owned skilled vs. desired/needed skills for the company's strategic goals, to lead toward structured competence development plans within companies. The developed model is entirely based on the extant literature findings, starting from the new taxonomy built in this contribution about the skills and job profiles required in the Industry 4.0 era.

The fourth paper, "Advances in Adaptive Scheduling in Industry 4.0" by Mourtzis, aims to summarize the design and development of solutions based on cutting-edge technologies such as Cloud Computing, Artificial Intelligence (AI), Internet of Things (IoT), Simulation, 5G, and so on. The first part of the paper discusses the development of a Cloud-based production planning and control system for discrete manufacturing environments. The proposed approach takes into consideration capacity constraints, lot sizing and priority control in a "bucket-less" manufacturing environment. Then, an open and interoperable Internet of Things platform is discussed, which is enhanced by innovative tools and methods that transform them into Cyber-Physical Systems (CPS), supporting smart customized shopping, through gathering customers' requirements, adaptive production, and logistics of vending machines replenishment and Internet of Things and Wireless Sensor Networks for Smart Manufacturing.

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Conflict of interest

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