

Invited Session

Challenges and opportunities in applying Additive Manufacturing for Operations and Supply Chain Management

Organized by:

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Additive Manufacturing (AM) has recently emerged as a disruptive manufacturing technology since it allows to produce in a fast and simple way parts with a level of complexity not even imaginably achievable with conventional manufacturing (CM) techniques (e.g., casting, rolling, etc.). Aerospace and automotive sectors were the pioneers in exploiting the possibilities achievable via producing parts in AM, and its use has now expanded to other sectors and applications. The biomedical sector, for example, has started producing implants via AM since it enables to produce implants that matches the human body requirements closer than what achievable via CM techniques, while after-sales companies have been attracted by the possibility provided by AM to digitalize their inventories since AM enables to reduce the stock levels by producing spare parts on demand. Furthermore, the possibility of AM to produce parts on the site of use makes so that AM has repercussions not only on the production phase, but on the whole supply chain. In fact, by producing parts on the site of use, the supply chain complexity can be decreased (less echelons are required), as well as its environmental footprint, while its responsiveness can be highly increased. This is particularly important considering the current times where the global instabilities are affecting our lives and the frequency of natural disasters might increase due to the global warming. In such a context, AM can increase the resilience and viability of supply chains, as well as support humanitarian organizations in the first recovery phase after the occurrence of natural disasters or other disruptive events.

However, despite all the above-mentioned potentialities and benefits of AM, its deployment is still limited. Some main limitations, in fact, hamper its diffusion. Firstly, AM parts are more expensive than CM counterparts, hence reducing or even cancelling some of the above-mentioned economic benefits achievable. This is further exacerbated if parts need to be qualified according to the different standards (ISO, ASTM, ...): a very limited number of companies/institutions is currently certified to qualify AM parts (contrarily to CM parts), and this hence has a high impact on AM parts' costs. Moreover, the still high investments necessary for buying an AM machine limit the cases where producing parts on the site of use is economically convenient. Furthermore, recent years have seen an increasing number of legal actions for Intellectual Property (IP) infringement when using AM parts (for example for face masks during the battle against Covid-19 pandemic), and this highly affect the possibilities to use AM in the first recovery phase after the occurrence of natural disasters or other disruptive events. Finally, some dilemmas arise also from an environmental perspective. In fact, on the one hand, AM allows to reduce the environmental footprint by producing parts on the site of use, but, on the other hand, the AM production process is very demanding in terms of energetic consumptions. Consequently, the overall environmental footprint might not be reduced if the whole product lifecycle is considered. It is hence still not clear when it is really convenient to adopt AM, and this becomes even more uncertain if we include in the analysis the risks of disruptions: the adoption of AM might lead to higher costs, but it might ensure the viability of the supply chain.

This session aims at solving these dilemmas collecting novel and innovative studies that support the adoption of AM by identifying under which conditions the benefits of AM are such to overcome their limitations.

Topics may include (but are not limited to):

- Adoption of AM in supply chains
- Digital inventories
- Impact of AM on supply chain design
- Impact of AM on supply chain planning and control

- Hybrid conventional-additive manufacturing supply chain
- AM for supply chain resilience/viability
- AM for spare parts supply chains
- AM for biomedical supply chains
- AM for humanitarian supply chains
- AM for sustainable supply chains
- Qualification tests in AM supply chains
- IP issues in AM supply chains
- Scheduling and nesting of AM machines
- Environmental footprint of AM life cycle

Both theoretical and applied research contributions and real-world application feedback are welcome.

Submission

For author guidelines, please refer to www.ifac-control.org. All papers must be submitted electronically using <https://ifac.papercept.net/> and must follow the two-column format in accordance with the IFAC manuscript style. Please use the official IFAC instructions and template to prepare your contribution as a full-length draft paper (6 pages). Submission details are available on the symposium website. There is the possibility to submit discussion papers (limited to 4 pages) that are published in the preprints only. All submissions must be written in English. All articles that comply with the submission guidelines will be peer-reviewed by IPC members. The corresponding author submits the paper online (pdf format) as an open-invitation session paper. **Special issues of IFAC MIM2025 Conference are planned in IFAC and other high-ranking journals.**

IMPORTANT DATES:

30/11/2024 - Full regular papers, papers invited for invited tracks/sessions, extended abstracts deadline

30/01/2025 - Notifications to authors and Registrations open

28/02/2025 - Camera ready paper submission deadline