Abstract ID 458

SUSTAINABLE VALUE ROADMAP FOR AM DRIVEN SUPPLY CHAINS

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Keywords: Business Opportunities, Technology Adoption, Additive Manufacturing, Roadmap, Sustainability

Summary: Additive manufacturing (AM) technologies are transforming supply chains across different sectors, decentralizing manufacturing activities, reducing transportation needs and increasing resilience. This paradigm change presents significant opportunities to increase environmental and social sustainability, however, recent studies show that the environmental impact of AM may not be as low as expected, partially due to high energy demands. While localized production and material optimization contribute to reducing environmental impact, these measures alone may not be sufficient to ensure long-term sustainability. Furthermore, introducing AM in supply chains not only contributes to the decentralization of manufacturing, but it can also have a profound impact on the various stakeholders, amongst which local community and workers. Addressing this challenges is forcing researchers, industrial players and policy makers to develop adoption strategies grounded in a life cycle perspective. This paper focuses on the sustainability challenges and opportunities in AM-driven supply chains and proposes a systematic roadmap to identify sustainable business models and adoption pathways. The roadmap is structured into four key components: Vision, Drivers, Business Opportunities, and Enablers, mapped across a timeline that extends to 2050. The Vision sets a long-term strategic goal for sustainable AM adoption, aligning economic, environmental, and societal benefits. The results consolidate insights from industrial players and scientific literature while providing a clear strategic framework for the sustainable adoption of AM in supply chains.