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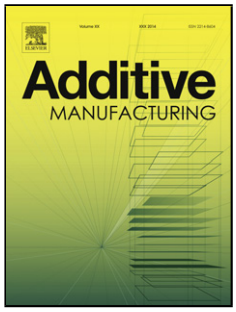

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Streamlining the Additive Manufacturing Digital Spectrum: A Systems Approach

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ABSTRACT:

Additive Manufacturing (AM) promises great potential benefits for industrial manufacturers who require low volume and functional, highly complex, end-use products. Commercial adoption of AM has been slow due to factors such as quality control, production rates, and repeatability. However, given AM's potential, numerous research efforts are underway to improve the quality of the product realization process. A major area of opportunity is to complement existing efforts with advancements in end-to-end digital implementations of AM processes. New paradigms are needed to support more efficient and consistent design-to-product transformations. Systematically-configured digital implementations would facilitate informational transformations through standard interfaces, streamlining the AM digital spectrum. Here, we propose the development of a federated, information systems architecture for additive manufacturing. We establish an information requirements workflow for streamlining information throughput during product realization. The architecture is delivered through the development of a solution stack, including the identification of areas where advancements in information representations will have the highest impact. The architecture will specify the stages of the product realization process, and the interfaces needed to link those stages together. Common data structures and interfaces will allow developers and end users of additive manufacturing technologies to simplify, coordinate, validate, and verify end-to-end digital implementations.

Keywords: additive manufacturing, systems engineering, digital thread, information systems architecture

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