

An Information Modeling Framework and Desktop Application to Compose Unit Manufacturing Process Models for Sustainable Manufacturing Assessment

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Abstract

The demand from consumers for more sustainable products, and the need to comply with government regulations motivates manufacturers to evaluate their operations for opportunities to improve product sustainability. Manufacturers have found such opportunities through the use of sustainability assessment methods and tools. Recently however, manufacturers have struggled to maintain the necessary gains due to the inadequacy of current, mature sustainability assessment methods and tools. The research conducted herein posits that this situation can be overcome through the advancement of information modeling and the automation of manufacturing system assessments. Therefore, the work presented attempted three goals: 1) Assess the barriers to sustainable manufacturing through a review of the academic literature and roundtable meetings with industry; 2) Propose an information modeling framework to trace, capture, and control information flows within a composed manufacturing system for sustainability assessment; and 3) Develop a desktop application implementing the framework to accelerate the sustainability assessment of composed manufacturing systems. Results from realizing the framework through an underpinning XML Schema and overlaying graphical user interface indicate that the presented approach would be useful in conducting sustainable manufacturing assessments. Future work should focus on improving the robustness of the information framework and the resulting XML Schema by incorporating validation of content and structure for improved quality and composability of unit manufacturing process models.

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