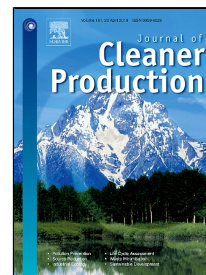


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Towards a Life Cycle Sustainability Analysis: A Systematic Review of Approaches to Sustainable Manufacturing



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# Towards a Life Cycle Sustainability Analysis: A Systematic Review of Approaches to Sustainable Manufacturing

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## Abstract

In 2011, the international organisations launched the Life Cycle Sustainability Assessment Framework for experts from different disciplinary fields to discuss and develop a holistic and integrated approach that supports effective sustainable development and sustainability decision-making. In response, various authors have used combinations of sustainable manufacturing methodologies and approaches to support this goal. This paper used a structured approach to a literature review to systematically examine sustainable manufacturing approaches between 2006 and 2015, and the move from segmented assessment methods to the holistic and integrated Life Cycle Sustainability Analysis. The analysis of the identified 54 relevant contributions indicated 68.5% of the articles focused on sustainable product development techniques, whereas 31.5% on sustainability assessment techniques. From the second, 70.4% of these were segmented approaches while only 29.6% incorporated the three sustainability dimensions. Further, the analysis showed that the energy aspect was incorporated into all the approaches, and there is a dearth of holistic approaches to sustainable manufacturing. Additionally, the paper initiates a theoretical framework that will underpin the development of a holistic simulation-based analytical framework that integrates goals that support progressive sustainable product development with methods that focus on the holistic quantitative analysis of the three sustainability dimensions.

*Keywords: Life Cycle Sustainability Analysis, Sustainable Manufacturing, Sustainable Product Development, Sustainability Performance Assessment*

## 1. Introduction

The challenges involved in extracting and transforming raw materials into consumers' product are enormous, and the unintended consequences of the associated activities are currently placing a great demand and additional responsibilities on how decisions are made in the manufacturing industries. Research has established that manufacturing activities are causing alarming degradation to the planet's natural resources and generating harmful effects on the general society (*Cannata et al., 2009; Rahimifard et al. 2010; Aramcharoena and Mativenga, 2014; Ribeiro and Kruglianskas, 2013; Kalakul et al., 2014*). In the past, before the declaration of Brundtland report tagged "*Our Common Future*", the objectives of the manufacturing

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