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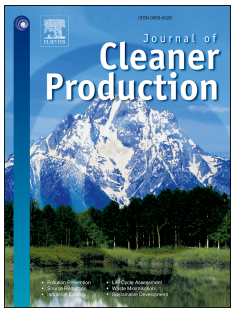

A big data analytics architecture for cleaner manufacturing and maintenance processes of complex products

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PII: S0959-6526(16)31019-8

DOI: 10.1016/j.jclepro.2016.07.123

Reference: JCLP 7695

To appear in: *Journal of Cleaner Production*

Received Date: 7 August 2015

Revised Date: 24 May 2016

Accepted Date: 20 July 2016

Please cite this article as: Zhang Y, Ren S, Liu Y, Si S, A big data analytics architecture for cleaner manufacturing and maintenance processes of complex products, *Journal of Cleaner Production* (2016), doi: 10.1016/j.jclepro.2016.07.123.

A big data analytics architecture for cleaner manufacturing and maintenance processes of complex products

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Abstract： Cleaner production (CP) is considered as one of the most important means for manufacturing enterprises to achieve sustainable production and improve their sustainable competitive advantage. However, implementation of the CP strategy was facing barriers, such as the lack of complete data and valuable knowledge that can be employed to provide better support on decision-making of coordination and optimization on the product lifecycle management (PLM) and the whole CP process. Fortunately, with the wide use of smart sensing devices in PLM, a large amount of real-time and multi-source lifecycle big data can now be collected. To make better PLM and CP decisions based on these data, in this paper, an overall architecture of big data-based analytics for product lifecycle (BDA-PL) was proposed. It integrated big data analytics and service-driven patterns that helped to overcome the above-mentioned barriers. Under the architecture, the availability and accessibility of data and knowledge related to the product were achieved. Focusing on manufacturing and maintenance process of the product lifecycle, and the key technologies were developed to implement the big data analytics. The presented architecture was demonstrated by an application scenario, and some observations and findings were discussed in details. The results showed that the proposed architecture benefited customers, manufacturers, environment and even all stages of PLM, and effectively promoted the implementation of CP. In addition, the managerial implications of the proposed architecture for four departments were analyzed and discussed. The new CP strategy provided a theoretical and practical basis for the sustainable development of manufacturing enterprises.

Key words： Cleaner production, Product lifecycle, Manufacturing, Maintenance, Big data analytics, Data mining, Sustainable production

1. Introduction

The increasing pressure from manufacturing industry on the energy consumption, especially the accompanying pollution threats, calls for a more environmental-friendly production mode. Cleaner production (CP) has been hailed for the several economic, environmental and social benefits it can provide (Silva et al., 2013; Kantola et al., 2015), and is