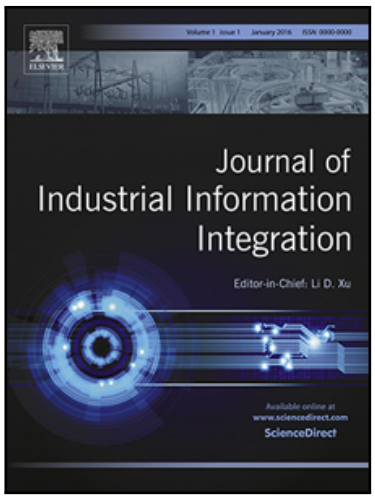


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# Data and Knowledge Mining with Big Data towards Smart Production

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**Abstract:** Driven by the innovative improvement of information and communication technologies (ICTs) and their applications into manufacturing industry, the big data era in manufacturing is correspondingly arising, and the developing data mining techniques (DMTs) pave the way for pursuing the aims of smart production with the real-time, dynamic, self-adaptive and precise control. However, lots of factors in the ever-changing environment of manufacturing industry, such as, various of complex production processes, larger scale and uncertainties, more complicated constrains, coupling of operational performance, and so on, make production management face with more and more big challenges. The dynamic inflow of a large number of raw data which is collected from the physical manufacturing sites or generated in various related information systems, caused the heavy information overload problems. Indeed, most of traditional DMTs are not yet sufficient to process such big data for smart production management. Therefore, this paper reviews the development of DMTs in the big data era, and makes discussion on the applications of DMTs in production management, by selecting and analyzing the relevant papers since 2010. In the meantime, we point out limitations and put forward some suggestions about the smartness and further applications of DMTs used in production management.

**Keywords:** Big data, data mining techniques (DMTs), production management, smart manufacturing, statistical analysis, knowledge discovery

## 1. Introduction

We are in a big data era with explosively growing data. In May 2011, McKinsey Global Institute firstly published a research report, named *Big Data: The next frontier for innovation, competition, and productivity*. This report notes that big data has penetrated into all respects of life, and gradually becomes an important factor in production. The application of massive data indicates development of productivity and surplus of consumers[1]. The arrival of the big data era inevitably brings up challenges for the ability of data controlling. To exploit value of data, to escape from the plight of 'data grave', to seek for second and third or even more utilization by massive data, and to form a sustainable competitive advantage, are not only the challenges that all manufacturing enterprises have to face with, but also the opportunities they obtain. Knowledge discovery in database was defined in 1989, as a nontrivial process of identifying valid, novel, potentially useful and ultimately understandable patterns from a data set[2]. Data mining is a key step of knowledge discovery, which is based on the technology of database and usually refers to the process of searching for the hidden information in a large amount of data. The big data era makes it possible to find valuable information and to make the best decision more easily with some advanced data mining techniques (DMTs).