

Chapter 96

How Big Data Transforms Manufacturing Industry: A Review Paper

Victor I. C. Chang

 <https://orcid.org/0000-0002-8012-5852>

Xi'an Jiaotong-Liverpool University, Suzhou, China

Wanxuan Lin

Xi'an Jiaotong-Liverpool University, Suzhou, China

ABSTRACT

This article describes an overview of what Big Data is and explains how it transforms the manufacturing industry. First, this article defines what Big Data means for the manufacturing industry. It explains four advantages about Big Data analytics and their benefits to manufacturing. Then, it describes about what ethical issues of Big Data are. Next, it discusses more deeply about the ethical issues of Big Data in manufacturing with both individual and organizational perspectives. Finally, this article sums up with some principles to show the ethical governance of the interests of Big Data stakeholders.

INTRODUCTION

This paper discusses the role of Big Data in the manufacturing industry. It attempts to provide a holistic review of the literature and offers discussion around the underlying gaps. The manuscript further discusses the ethical issues within the context.

DOI: 10.4018/978-1-6684-3662-2.ch096

BIG DATA

Big Data is a term that describes the large volume of structured and unstructured data with the potential to be mined for information. It figures a new technology paradigm for data that are created at massive volume and high velocity, and comes from various sources (Lee, 2017). Herschel and Miori introduces Big Data is to capture, store, share, evaluate, and act upon information that generated and distributed by humans and equipment using networks and computer-based technologies (Herschel & Miori, 2017). Gartner also defined Big Data as a high volume, high velocity and high variety information property that requires new handle mode to enhance decision-making ability, insight discovery, and process optimization (Gandomi & Haider, 2015).

Big Data is defined by IBM data scientists in terms of four dimensions: volume, variety, velocity, and veracity (Yin & Kaynak, 2015). Volume means the amount of data is huge, which is from TB level up to PB level. Variety means data comes from different kinds of formats, such as video, image, location, weblog and so on. Velocity means the speed of data processing is very fast and this is essentially different from traditional data mining. Veracity means the quality and trustworthiness of the data. The importance of Big Data depends on the support for decision-making. The size of the data does not determine whether it helps to make decisions, but the authenticity and quality of the data are the basis for making successful decisions.

In a word, the ability to acquire valuable information rapidly from various data can be classified as Big Data technology. Using Big Data becomes a critical factor in improving core competitiveness, and decision-making is transforming business-driven into data-driven in all walks of life (Carillo, 2017).

Nowadays, data has infiltrated every industry and business function. It is generated always and transmitted by every digital process and social media exchange, such as GPS positioning, purchase transaction records and posts on social platform. How to manage and further use data and information to support the decision-making of organizations has become an urgent need and even become the core competitiveness of enterprises (Dobbs et al., 2011).

The emergence of Big Data keeps changing people's existing habits and life patterns and gradually changing the production patterns of manufacturing enterprises. The demand for today is no longer in short supply situation like 30 years ago but the era that manufactures rack their brains for marketing. In China, since the reform and opening-up, the Internet has played an important role on the rapid development of science and technology (Xu, He, & Li, 2014). As the same time, both logistics technology and information and communication technology have provided a great support for the development of the Internet. Therefore, the increasing amount of data has brought great challenges to manufacturing industry while also offering golden opportunities for business and transformation.

BIG DATA IN MANUFACTURING INDUSTRY

Manufacturing is one of the main areas of Big Data applications and it can be described as a 5M system consisting of materials, machines, methods, measurements and modeling (Lee et al., 2013). Big Data provides a transparent infrastructure for manufacturing that addresses such uncertainties as inconsistent component performance and availability (Inukollu, 2014). One of the Big Data applications in manufacturing is predictive manufacturing and its conceptual framework starts with data collection, where it is possible to obtain different types of sensory data such as stress, vibration, acoustics, voltage, current,

13 more pages are available in the full version of this document, which may be purchased using the "Add to Cart" button on the publisher's webpage:

www.igi-global.com/chapter/how-big-data-transforms-manufacturing-industry/291075

Related Content

Fuzzy Bayesian Context-Aware System to Reduce Electricity Consumption

Kavita Pankaj Shirsat and Girish P. Bhole (2021). *International Journal of Data Analytics* (pp. 86-98).

www.irma-international.org/article/fuzzy-bayesian-context-aware-system-to-reduce-electricity-consumption/272110

Data Envelopment Analysis Advantages and Problems Demonstrated in a University Comparison Study

Kenneth David Strang (2024). *Data Envelopment Analysis (DEA) Methods for Maximizing Efficiency* (pp. 18-39).

www.irma-international.org/chapter/data-envelopment-analysis-advantages-and-problems-demonstrated-in-a-university-comparison-study/336939

Assessment and Evaluation of Students' Performance Without Learning Analytics

Sushant Zesu (2018). *Impact of Learning Analytics on Curriculum Design and Student Performance* (pp. 96-112).

www.irma-international.org/chapter/assessment-and-evaluation-of-students-performance-without-learning-analytics/198665

Focused Error Analysis: Examples from the Use of the SHEEP Model

Deborah J. Rosenorn-Lanng and Vaughan A. Michell (2016). *International Journal of Big Data and Analytics in Healthcare* (pp. 30-48).

www.irma-international.org/article/focused-error-analysis/171403

Data Analysis and Visualization in Python for Polar Meteorological Data

V. Sakthivel Samy, Koyel Pramanick, Veena Thenkanidiyoor and Jeni Victor (2021). *International Journal of Data Analytics* (pp. 32-60).

www.irma-international.org/article/data-analysis-and-visualization-in-python-for-polar-meteorological-data/272108