Chapter 88
Big Data Analytics in Supply Chain Management

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ABSTRACT

The current approach to supply chain intelligence has some fundamental challenges when confronted with the scale and characteristics of big data. In this chapter, applications, challenges and new trends in supply chain big data analytics are discussed and background research of big data initiatives related to supply chain management is provided. The methodology and the unified model for supply chain big data analytics which comprises the whole business intelligence (data science) lifecycle is described. It enables creation of the next-generation cloud-based big data systems that can create strategic value and improve performance of supply chains. Finally, example of supply chain big data solution that illustrates applicability and effectiveness of the model is presented.

INTRODUCTION

During the last several years there was an amazing progression in the amount of data produced within the supply chain information systems, but also externally. This poses many challenges related to data analysis specifically in terms of know-how, technology, infrastructure, software systems and development methods. The current business climate demands real-time analysis, faster, collaborative and more intelligent decision making.

The current approach to supply chain intelligence has some fundamental challenges when confronted with the scale and characteristics of big data. These include not only data volumes, velocity and variety, but also data veracity and value (Arunachalam, 2018).

The best way to effectively analyze these composite systems is the use of business intelligence (BI). Traditional BI systems face many challenges that include processing of vast data volumes, demand for real-time analytics, enhanced decision making, insight discovery and optimization of supply chain pro-

DOI: 10.4018/978-1-6684-3662-2.ch088

cesses. Big Data initiatives promise to answer these challenges by incorporating various methods, tools and services for more agile and flexible analytics and decision making. Nevertheless, potential value of big data in supply chain management (SCM) has not yet been fully realized and requires establishing new BI infrastructures, architectures, models and tools (Marr, 2016).

Supply chain BI system proved to be very useful in extracting information and knowledge from existing enterprise information systems, but in recent years, organizations face new challenges in term of huge data volumes generated through supply chain and externally, variety (different kind of structured and unstructured data), as well as data velocity (batch processing, streaming and real-time data). Most of the existing analytical systems are incapable to cope with these new dynamics (Larson & Chang 2016).

On the other hand, we have seen tremendous advancements in technology like in-memory computing, cloud computing, Internet of Things (IoT), NoSQL databases, distributed computing, machine learning, etc. Big data is a term that underpins a raft of these technologies that have been created in the drive to better analyze and derive meaning from data at a dramatically lower cost and while delivering new insights and products for organizations in the supply chain.

The key challenges for modern supply chain analytical systems include (Wang et al., 2016):

- Data explosion – supply chains need the right tools to make sense of the overwhelming amount of data generated by a growing set of data internal and external sources.
- Growing variety of data – most of the new data is unstructured or comes in different types and forms.
- Data speed – data is being generated at high velocity which makes data processing even more challenging.
- Real-time analysis - in today's turbulent business climate the ability to make the right decisions in real-time brings real competitive advantage. Yet many supply chains do not have the infrastructure, tools and applications to make timely and accurate decisions.
- Achieving simplified deployment and management – despite its promise, big data systems can be complex, costly and difficult to deploy and maintain. Supply chains need more flexible, scalable and cost-effective infrastructure, platforms and services, such as those offered in cloud

In this chapter, challenges and new trends in supply chain big data analytics are discussed and background research of big data initiatives related to SCM is provided. The chapter also describes the main technologies, methods and tools for big data analytics. The methodology and the unified model for supply chain big data analytics which comprises the whole BI lifecycle is presented. Architecture of the model is scalable and layered in such a way to provide necessary agility and adaptivity. The proposed big data model encompasses supply chain process model, data and analytical models, as well as insights delivery. It enables creation of the next-generation cloud-based big data systems that can create strategic value and improve performance of supply chains. An example of supply chain big data solution that illustrates applicability and effectiveness of the model is presented. Finally, future trends, directions and technologies are presented.