Chapter 7
Big Data Analytics Driven Supply Chain Transformation

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ABSTRACT

Big data has emerged as the new frontier in supply chain management; however, few firms know how to embrace big data and capitalize on its value. The non-stop production of massive amounts of data on various digital platforms has prompted academics and practitioners to focus on the data economy. Companies must rethink how to harness big data and take full advantage of its possibilities. Big data analytics can help them in giving valuable insights. This chapter provides an overview of big data analytics use in the supply chain field and underlines its potential role in the supply chain transformation. The results show that big data analytics techniques can be categorized into three types: descriptive, predictive, and prescriptive. These techniques influence supply chain processes and create business value. This study sets out future research directions.

INTRODUCTION

Big data promises to trigger a revolution in supply chain management (SCM) (Waller & Fawcett, 2013). Fawcett and Waller (2014) argued that big data is one of the forces that will redefine supply chain design. The big-data-driven digital economy facilitates this change by capturing, analyzing and using big data to make evidence-based decisions. Thousands of exabytes of new data are generated each year on a variety of digital platforms such as social media, mobile devices and the Internet of Things. Many companies can capitalize on this big data by managing risks, reducing costs and improving supply chain visibility.

Big data is often characterized by the five Vs: Volume, Velocity, Variety, Veracity, and Value (Fosso Wamba, Akter, Edwards, Chopin, & Gnanzou, 2015). The volume of big data refers to the quantity of data, which is increasing exponentially. Velocity is the speed of data collection, processing and analyzing in real time. Variety refers to the different types of data collected. The data can be structured (e.g., data found in relational databases), semi-structured (e.g., Extensible Markup Language – XML), or unstructured (e.g., images, audio, and video). Veracity represents the reliability of data sources. The

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variation in the data flow rates reflects the variability of big data, while the myriad of big data sources reflects its complexity. Finally, value represents the process of creating value from big data (Gandomi & Haider, 2015; Hashem et al., 2015; Kshetri, 2014). Fosso Wamba et al. (2015, p. 235) define big data analytics (BDA) as "a holistic approach to manage, process and analyze 5 Vs in order to create actionable insights for sustained value delivery, measuring performance and establishing competitive advantages."

Companies apply BDA in their supply chain to reduce cycle time, react faster to changes, optimize performance and gain insight into the future. A supply chain is defined as "a bidirectional flow of information, products and money between the initial suppliers and final customers through different organizations" (Nurmilaakso, 2008, p. 721); SCM includes planning, implementing and controlling this flow. BDA is expected to transform the supply chain (Fosso Wamba & Akter, 2015). Compared with traditional analytic tools, BDA could help companies to better understand customers' preferences and behavior and launch new products and services that are more customized (Duta & Bose, 2015). Several companies, such as Procter & Gamble, Walmart and Tesco, have benefited from the implementation of supply chain analytics (SCA), which enabled them to improve their operational efficiency and reduce costs (Chae, Olson, & Sheu, 2013). SCA refers to the use of supply chain data and analytical technologies and methods to improve operational performance (Chae et al., 2013). It represents the intersection of three academic disciplines: technologies (tools that support data processing), quantitative approaches (methods for analyzing data) and decision-making (tools used to support the decision-making process). These disciplines share a similar purpose: "…the improvement of business operations and decision making through the utilization of information, quantitative analyses, and/or technologies…" (Mortenson, Doherty, & Robinson, 2015, p. 585).

Three different aspects of analytics can be distinguished: (1) Descriptive analytics uses statistical methods and reports on the past; it is designed to answer the question "What happened?" (2) Predictive analytics uses models based on past data to predict the future and answer the question "What will happen next?" (3) Prescriptive analytics uses models to specify optimal behaviors and actions and answer the question "What should the business do next?" (Davenport, 2013; Lustig, Dietrich, Johnson, & Dziekan, 2010; Mortenson et al., 2015). Despite the benefits of BDA in SCM, companies may find it difficult to adopt the approach if they lack the capacity to make large investments, an analytic culture, executive support, a strong security framework, or analytic capability. In addition, creating business value from big data still represents a challenging and controversial mission as the steep growth curve of performance using analytics is flattening out (Kiron, Prentice, & Ferguson, 2014). Some scholars also describe the hype about big data as a myth, as it does not reflect innovative capability and improved firm performance (Manyika et al., 2011). Ross, Beath, and Quaadgras (2013, p. 90) state that "The biggest reason that investments in big data fail to pay off, though, is that most companies don't do a good job with the information they already have. They don't know how to manage it, analyse it in ways that enhance their understanding, and then make changes in response to new insights."

Motivated by this debate, the main objective of this research is to provide a comprehensive overview on BDA application in SCM and underscore its potential role in supply chain transformation. To this end, the author conducted a literature review to arrive at answers to the following questions:

- What big data analytic techniques are used in the supply chain field?
- How does big data analytics influence supply chain management?
- How can big data analytics create business value in supply chain?