Chapter 1
Big Data in Supply Chain Management Demand Forecasting and Inventory Optimization

Boutrous Khamis Juma
Marwadi University, India

Rituraj Jain
https://orcid.org/0000-0002-5532-1245
Marwadi University, India

Aaron F. Cooper
https://orcid.org/0009-0005-0035-5412
Marwadi University, India

Romanzi Zulu
Marwadi University, India

Damodharan Palaniappan
https://orcid.org/0009-0003-0721-3068
Marwadi University, India

Kumar Parmar
https://orcid.org/0000-0002-2502-5680
Marwadi University, India

T. Premavathi
https://orcid.org/0009-0003-0172-2021
Marwadi University, India

ABSTRACT

This chapter discusses how Big Data influences SCM, with focus on areas like demand forecasting, inventory control, and newer technologies. With real-time data, AI, and machine learning, improved forecasting, reduction of risks regarding overstocking or stockout, and better satisfaction of customers are all possibilities. Other advantages are cost reduction and better control over inventories. Market adaptation is driven by IoT and real-time data. While big challenges remain, including the poor quality of data, resistance to change, there is promise for SCM using big data through predictive analytics, collaboration, and ethical practices.

DOI: 10.4018/979-8-3373-0649-0.ch001

1. INTRODUCTION

Supply chain management (SCM) has to deal with unprecedented challenges such as forecast credibility, high inventory holding expenditure, and supply chain breakdowns. McKinsey states that businesses that integrate big data analytics tools in SCM systems can minimize prediction mistakes by 50% and inventory expenditure by 20-30% (Ittmann, 2015). This emphasizes the issue of big data and analytics in SCM at most. Agrawal et al. (2023) remarked that big data analytics boosts SCM by improving operational decision-making, productivity, and competitiveness. The adoption of new technologies such as Artificial Intelligence (AI), Internet of Things (IoT), and machine learning powered algorithms enable organisations to have better understanding of supply chain systems, improve management, and pinpoint future needs (Zeng and Yi, 2023; Eyo-Udo, 2024). For example, the new Incessant Data Processing (IDP) method suggested in (Zeng and Yi, 2023) proves that its participants' supply chain processes have more accurate data predictions by 9.93% and less data errors by 9.77%. Therefore, big data analytics presents immense possibilities towards overcoming age-old issues and ushering in new changes in SCM as The University of Wisconsin explains, "an intensive data driven approach are expected to make a dramatic positive impact." Nonetheless, this approach also creates concern over privacy of information, ethical issues, and shortage of qualified people.

New study is required to evaluate the impacts of big data on supply chain sustainability and the ethics of autonomous systems in SCM. This is necessary because the field is changing over time which makes it relevant to research its long term effects (Eyo-Udo, 2024; Goswami et al., 2024).

The term big data in SCM can be refer as the advanced analytics which is usually used to enhance decision-making across various company activities. By employing quantitative methods, big data expands the operational datasets available for internal analysis, moving beyond traditional approaches. In SCM, inventory control is one of the areas that is able to provide considerable satisfaction but it comes with its share of challenges. It has great benefits when it comes to the availability of items, but it also comes with risks. These risks include over investment in stock and its associated costs such as storage or maintenance, and in electronics, obsolescence of stock. New technology and the growth of the Internet has created a lot of attention in research into various aspects of big data such as capturing, storage and retrieval of data. In order to remain relevant and either maintain or increase their profitability, businesses that are active today have embraced the principle of precise marketing. Especially in product supply chains, great attention is drawn to forecasting as it is critical in knowing customer transactions and consumption patterns. SCM includes all the horizontal and vertical processes involved in the movement of goods and services from their point of origin, through distribution channels, to the end user.