

# Big Data Analytics in the Supply Chain In Indonesia

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**Submission date:** 13-Sep-2022 11:50AM (UTC+0700)

**Submission ID:** 1898618369

**File name:** 6.\_Big\_Data\_Analytics\_in\_the\_Supply\_Chain\_in\_Indonesia.pdf (466.95K)

**Word count:** 2284

**Character count:** 12666

# Big Data Analytics in the Supply Chain In Indonesia

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**Keywords:** big data analytics, supply chain, Indonesia

**Abstract.** In the midst of information communication technology development and massive disruptions such as the Covid-19 pandemic, big data analysis plays an important role in the supply chain. The aim of this study is to look at how big data analytics research and applications have progressed in the supply chain in Indonesia. While most studies typically have focused on the specific application of big data analytics in a specific industry, this paper attempts to conduct a systematic investigation to comprehend the larger picture. The method used is a systematic analysis of the Scopus database using search queries relevant to big data analytics on the supply chain in a specific Indonesian context. According to the study's findings, big data analytics is implemented in many industrial supply chains, including manufacturing, oil and gas, services, and agriculture. This paper contributes to the literature by investigating the use of big data analytics in the supply chain in Indonesia.

## Introduction

Big data analytics plays a vital role in the supply chain to connect companies with their supply chain networks both upstream and downstream. This vital role is increasing with high disruption due to rapid technological developments or unexpected challenges such as the current Covid-19 pandemic. Big data is expected to increase the total surplus generated from a supply chain so that all stakeholders can benefit from it.

Big data, which simply means a huge amount of data that accumulates second by second, day by day, year by year, has no meaning without being combined with sharp analysis of it. The sharp analysis uses mathematical and statistical tools applied to big data, then known as big data analytics. It can generate intelligence for supply chain network companies [1]. Previous definitions of big data analytics highlight that it is a company's unique capability to manage a lot of data (petabytes) in its supply chain that enables companies to obtain meaningful and insightful information to support decision making [2–4].

Globally, research and application of big data analytics in the supply chain have grown in such a way in recent years [5]. However, how this development took place in Indonesia or was researched by the Indonesian author is unknown. Indonesia is unique from a supply chain point of view with its archipelagic geographical location. It also faces a considerable challenge in the form of its high-cost logistics. It is caused, among others, by too many middlemen in the supply chain and high price fluctuations [6]. Information technology is expected to be able to help overcome these problems [6].

This paper serves as a preliminary review to look at how big data research and applications have progressed in the supply chain in Indonesia. A systematic search process is carried out on academic databases and then analyzed based on relevant concepts in supply chain management, especially from the supply chain (SC) macro process [7]. This paper is structured as follows. The first section is a brief background and study objectives. The second section explains the methods used to obtain data and analyze it. The third section is the results and discussion. The conclusion is presented in the last section.

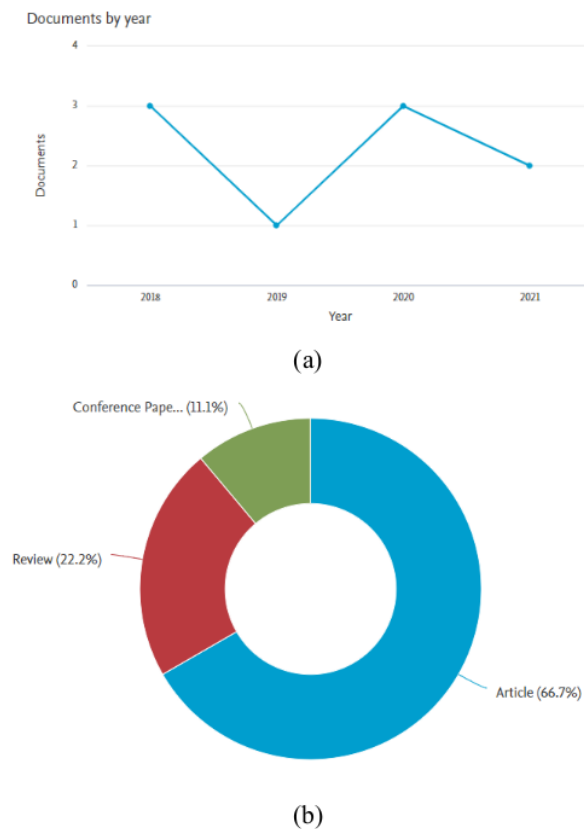
## Methods

A systematic review is used as an approach in this study by systematic search the academic database of Scopus. The academic database is known for its wide coverage, and at the same time, its maintained quality [8–10]. As the first step, search keywords that represent the research objectives are determined. The keywords used were "big AND data AND analytics AND supply AND chain" in the title, abstract, and keyword of the article, giving a rough search result of 525 articles. After that, the filtering process is carried out by utilizing the country affiliation identification feature devoted to publications with author affiliations from Indonesia. This process yielded nine articles. These results are small but reasonable for a preliminary review [9,11].

The data obtained were then analyzed qualitatively using a content analysis approach by identifying the article's attributes and synthesizing the findings. Attributes identified include the year of publication, place of publication, type of article, and subject area. The findings of the analyzed articles include what big data analytics applications are applied to, in what industry, and what are the interesting findings. The results of the analysis and their discussion are presented in the next section.

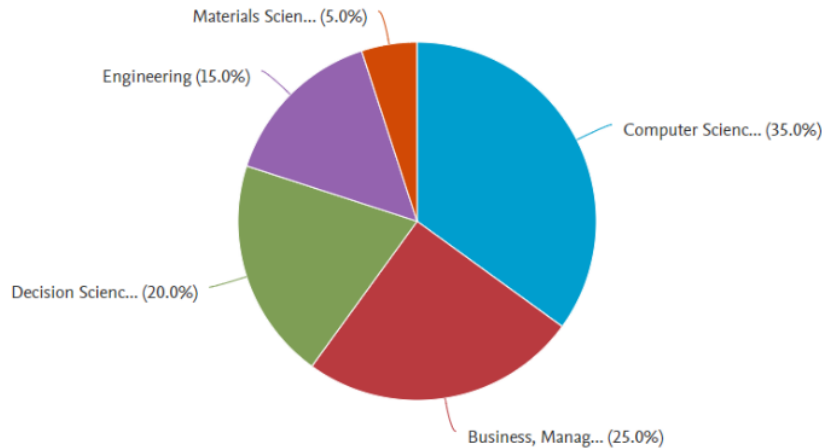
## Results and Discussion

In this section, the first article attribute analyzed is the year of publication (Figure 1). Most of these publications are journal articles (66.7%). Data for the year of publication shows that only in 2018 were articles published internationally with an Indonesian context or involving Indonesian authors discussing this topic. So the attention to this field is relatively new, especially in terms of research and international publications.



**Fig. 1.** Publication year (a) and type (b)

The articles are published in journals and proceedings. Journals that become outlets include Benchmarking, Computers and Industrial Engineering, IEEE Access, International Journal of Advanced Trends In Computer Science And Engineering, International Journal of Supply Chain Management, and Operations And Supply Chain Management. The dominant subject areas include computer sciences (35.0%), business, management, and accounting (25.0%), and decision sciences (20.0%) (Figure 2). This subject area represents the intersection of big data analytics in the supply chain, which is indeed the intersection of these three fields. In addition, this is in line with the definition of big data analytics, which emphasizes the role of computer science in analyzing big data to support business decision-making [2–4].



**Fig. 2.** Subject areas

To obtain an overview of the content, word cloud analysis was carried out on the article title, abstract, and keywords (Figure 3). The analysis results show that, of course, the search keywords involving the words big, data, analytics, supply, chain are the highest, with a total percentage of around 15%. The next keywords that emerged were rice (1.31%), machine and learning (0.88 and 0.81%), and production (0.75%). This indicates the use of big data analytics in agriculture, a traditional sector that has begun to utilize high technology such as big data analytics to support the success of its supply chain. This also indicates the role of machine learning that has been used at various stages in the supply chain flow [12].



Fig. 3. Word cloud

Based on the publications reviewed in Table 1, applications carried out in the Indonesian context or carried out by Indonesian researchers vary in the direction of upstream, internal supply chain management, or downstream SCM. The dominant application discussed is internal SCM, for example, for demand forecasting, system automation, data security, new product development, or inventory [12–16]. This is not surprising because before paying attention to the upstream or downstream supply chain, internal SCM needs to be strengthened first. For upstream direction, the applications discussed, for example, include supply planning, strategic sourcing, or collaborative SCM [17,18]. Downstream is one of the few that has been studied with the example of logistics and distribution [13,15,17].

Table 1. Reviewed papers

Author (s) and year	Industry	Technology involved	Application	Up stream	Internal	Down stream
Alfred et al. (2021) [20]	Agriculture	Big Data, Machine Learning, and Internet of Things (IoT)	Smart irrigation, yield estimation prediction, growth monitoring, disease monitor, etc		✓	
Aamer et al. (2020) [12]	Manufacturing and agriculture	Data analytics	Demand forecasting		✓	
Ishomuddin (2020)	NA	Internet of things	Communities activities		✓	
Nurhasanah et al., (2020) [17]	Natural fiber	Internet of things and Big data	Collaborative supply chain management	✓		✓
Makmur et al., (2020) [18]	Fast-moving consumer goods (FMCG)	Big data	Supply planning	✓		
Wang & Saputra, (2019) [13]	Logistics (petroleum chemicals)	Internet of things and big data	Tank Terminal Automation System (TAS)		✓	✓
Fernando et al. (2018) [14]	Service	Big Data analytics	Data security and service innovation		✓	
Tiwari et al., (2018) [15]	Mixed: healthcare, consumer, energy, manufacturing, technology, banking	Big Data analytics	Strategic sourcing, network design, NPD, demand planning, procurement, production, inventory, logistics, and distribution,	✓	✓	✓
Widaningsih et al., (2018) [16]	Financial	Big Data analytics	Financial SCM		✓	✓

The sectors studied are diverse, both manufacturing, service, agriculture, or mixed sectors. In the manufacturing sector, the research is, for example, regarding demand forecasting or supply planning for fast-moving consumer goods (FMCG) products [18]. For the service sector, the application discussed in the literature is about financial or logistics, including to help service innovation [13,16]. It indicates that innovation can be helped by information technology [14,19]. Agriculture is also discussed with various applications such as smart irrigation or disease monitoring [20]. From these discussions, it is known that the publication of big data analytics in the supply chain in Indonesia has not been widely carried out and provides an open space for researchers to contribute to its development.

### Conclusion

This study is a preliminary attempt to explore big data analytics research and application in Indonesia. This study has revealed that studies in Indonesia have only developed in the last three years to involve major fields of computer science; business, management and accounting; and decision sciences. The applications discussed in the scientific literature reviewed include big data applications towards upstream, internal, and downstream with the most focus on internal SCM. These findings suggest that research on big data analytics in the supply chain in Indonesia still needs to be further developed. This study is limited by there are still few publications that discuss this topic even though in practice in Indonesia, it could be widely applied to the supply chain of companies in Indonesia. This study suggests that further works be done to empirically explore big data applications in the supply chain in Indonesia in more depth.

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