Supply Chain Orchestration Tool: using Data Driven Decision Modelling

Vishal Makode  
200875978Dr. Flynn Castles  
Msc IOT (Data)

***Abstract* — There are several publications on the application of predictive analytics in Supply Chain Management (SCM). However, most of them are limited to specialised supply chain management tasks, such as Logistics, Transportation, Demand prediction, Demand management, Inventory management or other pure research elements. The primary focus of the report is on improving visibility to manage complexity and assist decision-making for handling risk and disruptions along the supply chain. Demand management and Procurement are the two main areas of SCM in which predictive analytics is often applied. This report has two objectives: first, to provide an overview of supply chain management functions (SCMF), apply data-driven predictive analytics, highlighting practical approaches, algorithms, or models in SCM through a comparative review of several machine learning approaches and secondly present a comprehensive supply chain orchestration tool encompassing all those finding into production-ready functional software. For these reasons, pertinent literature information was obtained and evaluated. Accordingly, this report will present the data pipeline, data insights, cloud architectures, and machine learning models for predictive analytics and their performances. These will form the basis for the SCM orchestration tool, which includes all the necessary components to implement SCMF with an intuitive dashboard for supply chain managers and data analysts.**

***Keywords* — Supply chain management, Forecasting, Neural networks, Big Data Analytics (BDA), Predictive Analytics, Machine learning (ML), Recurrent Neural Network (RNN), Random Forest, Kubernetes, cloud, Dashboard, Docker, Mongo DB**

# Introduction

Supply chains contribute significantly to user satisfaction, budget control, and a corporation's responses to market advantages and risks. While examining their cost considerations, timeframes, and stock control, firms pursue efficiency, dependability, and reproducibility (Zhang *et al.*, 2016) to evaluate and avoid occurrences and circumstances affecting logistics management, from the most frequent (production delays, manufacturing faults) to the most significant (social turmoil, environmental disasters, manufacturers' financial distress). Several characteristics could complicate the nature of production processes in contexts where uncertainty is already present. As a result of the swift advancement of technology, the lifespan of products is decreasing at an unprecedented rate. Organisations throughout the globe are utilising reverse supply chain (RSC) tactics to circumvent laws and create profit-generating options. Generally, the production planning procedure can identify the ideal implementation plan for a supply chain's production and logistical activities. A computer program that facilitates the detection of concealed data within collections. While combining data mining and optimization, after the confidential information is recovered from the collection, the feature selection of an optimization problem could be decreased (Aria and Cuccurullo, 2017). Thus, a practical or high-quality response can be identified in a small amount of time and computational performance. To exemplify the efficacy of this strategy, an optimal machine learning technique has been applied to a limited optimal control problem, and the outcomes are clarified

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Description automatically generated As the economy has been growing, the quality of human existence has continually improved. In addition, as the market for various items rises, individuals are placing an increased significance on product durability and safety (Han and Zhang, 2021). The supply chain management fundamentally is a technique which combines several conceptual frameworks (Turkulainen and Swink, 2017), as several scholars have long predicted that integration will be an essential factor of supply chain research (Luo and Yu, 2019). The commercial supply chain has shifted from a single regional vertical clustering to an internally strategic alliance and will evolve into a stage characterized by several supply chain functional relationships (Gholamian and Taghanzadeh, 2017).

Fig. 1. Understanding supply chain.

As per (Mentzer *et al.*, 2001), the supply chain is the network of businesses having many actions and procedures that produce wealth in the shape of goods and services given to the end user. These links, operations, and activities depend on ecosystem modelling, planning, and management to function effectively to produce more flexible and sustainable supply chain. Artificial intelligence (AI) capabilities have evolved in numerous industries in recent decades, especially in supply chains (Borges *et al.*, 2021). AI enables computers to make intelligent decisions and complete operations without personal interaction. Industries use AI and machine learning to understand various parameters, including logistics, supply chain features, and storage. Supply chain automation definitions change depending on the standpoint from which they are formulated (Zhang, Pee and Cui, 2021).

# Related work

The data-driven supply chain is an integral part of today’s business to move products from one site to another. This type of supply chain optimizes the exposure of the product from