Supply Chain Orchestration: Using Data Driven Decision Modelling

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# Introduction (*Heading 1*)

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) 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. Organizations throughout the globe are utilizing reverse supply chain (RSC) tactics to circumvent laws and create profit-generating options. Managing RSC processes worldwide becomes crucial because of increasing international competitiveness, stricter environmental requirements, and various chances for earning and enhanced business reputation (Collin, Eloranta and Holmström, 2009). Generally, the production planning procedure can identify the ideal implementation plan for a supply chain's production and logistical activities. According to its practical use, the area is now relevant to academics and professionals. Data mining is a methodology for extracting information from large databases (Song and Song, 2021). 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, a machine learning technique for optimal has been applied to a limited optimal control problem, and the outcomes are clarified.

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). Currently, most of the items moving in the state are distributed via the conventional horizontal cluster product supply chain (Kim and Fortado, 2021). Numerous issues, including the complexity of continuous improvement, significant merchandise damage, lengthy delivery schedules (Robinson *et al.*, 2018), outdated distribution systems, high logistics operations, and relatively low productivity, make it challenging to conform to the key generation (Bals and Turkulainen, 2017). Supply chain management is the most profitable and efficient strategy to respond to the existing intense competition. The fundamental of supply chain management is a technique combined conceptual framework (Turkulainen and Swink, 2017), and several scholars have long predicted that integration will be an essential factor of supply chain research (Luo and Yu, 2019). Consequently, the beginning of organizational learning in the product supply chain and the implementation of digital technologies to enforce an effective system is now the foundation for breaking through modernization deadlock and expanding markets (Han and Zhang, 2021), as well as the eventual target for the capacity building of merchandise distribution network control and administration in today's society (Mogale, Kumar and Tiwari, 2020). 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).

As per (Mentzer *et al.*, 2001)), the supply chain is the network of businesses in the many actions and procedures that produce wealth in the shape of goods and services given to the end user. These links, operations, and activity affect ecosystems, modeling, planning, and management to function effectively within the challenging environments where proper utilization performs and to produce more flexible and sustainable supply chains. 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 fields, including logistical, supply chain management, and storage. Automation definitions change depending on the standpoint from which they are formulated (Zhang, Pee and Cui, 2021).

A limited definition of artificial intelligence can include all machines and devices that use computing capabilities to simulate human intelligence (Kitsios and Kamariotou, 2021). Dependent on what AI accomplishes, various explanations of AI are commonly divided into three areas based on the human component and take precedence: devices that consider and behave like humans and (ii) algorithms that operate and think logically. AI can generally be characterized as a machine's capacity to replicate human intellect, with the idealized potential to evaluate and execute commands that have a high probability of reaching a certain goal (Čerka, Grigien\.e and Sirbikyt\.e, 2015). AI enables it to apply predictive methodologies that enable rapid evaluation and more comprehensive mitigation of hazards or utilized to portray that may develop across the supply chain. It also provides the capability to determine supply chain abnormalities (Akbari and Do, 2021). AI can efficiently and precisely locate key supply chain statistics to construct models that help executives comprehend how each system works and make recommendations for improvement (Ni, Xiao and Lim, 2020). In this new method of utilizing machine learning to enhance the supply chain and look for optimizations, AI helps businesses to continuously learn about activities needing development, discover determinants of output, and anticipate efficiency (Riahi *et al.*, 2021). AI in the supply chain framework continues an innovation whose maximum capabilities humans have yet to comprehend (Nayal *et al.*, 2021).  We proposed a robust approach to finding the effectiveness of machine learning and artificial intelligence over supply chain management.

# 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 unprocessed materials to its usage. Such visibility enables sophisticated supply chains to achieve improved service performance and real-time supply chain knowledge. On the other hand, complete integration has not yet been attained; It is a challenging problem due to the significance of integration for operations in this context. (Castro et al., 2009) introduced a model design that integrates semantically supported simulation with the orchestration of fusion operations. Additionally, the results have shown improved selections based on the newest and optimized information. Furthermore, a significant data-driven decision model has been used to validate this model. Initially, the model integrates a semantic business process framework with assistance from the SCOR taxonomy that will enable the development of multimodal integration workflows in the supply chain in compliance with the known benchmark. Therefore, a conversional language will be employed to create the web service for translation tasks. Additionally, integrating these translators into the business executable process system is also effective process-level interoperability. (Tountopoulos et al., 2018) [2] highlighted the progress in defining a controlling context for data-driven orchestration of utility services in potential intelligent production applications. In addition, the study analyzed the relevance and significance of multi-aspect data in the control of production processes and presented a reference model for orchestrating the different data services. This demonstrates the capability of data-driven service orchestration to facilitate intelligent business scenarios in state-of-the-art manufacturing disruption management. Additionally, the significance of data-driven service orchestration in enhancing decision-making systems within intelligent manufacturing-based ecosystems has been emphasized.

(Hauser et al., 2017) intended to develop a cloud platform that enables the creation of services for the administration of collaborative planning systems among supply chain individuals. Additionally, this study proposed a concept structured via the platform’s five principal services: simulation, detection, evaluation, transformation, and workflow orchestration. First, it introduced the first 4 essential services via the establishment of rules for data analysis, automatic simulation of a supply chain scenario, evaluation of deviations, and modeling of an adaption method. Finally, it discussed the principle of orchestration techniques. (Dalmolen et al, 2015) provided a unique method for supply chain choreography to assist supply chain businesses in generating chain integration that is smooth in practice. Initially, the author developed a body of knowledge by merging supply chain collaboration and constraints literature with scientific observation acquired from applied research and commercial projects. Next, they presented a semantic model that enables fair transition and the creation of an ecosystem in which customizable logistics are the future.

##### References

Akbari, M. and Do, T.N.A. (2021) ‘A systematic review of machine learning in logistics and supply chain management: current trends and future directions’, *Benchmarking: An International Journal* [Preprint].

Aria, M. and Cuccurullo, C. (2017) ‘bibliometrix: An R-tool for comprehensive science mapping analysis’, *Journal of informetrics*, 11(4), pp. 959–975.

Bals, L. and Turkulainen, V. (2017) ‘Achieving efficiency and effectiveness in Purchasing and Supply Management: Organization design and outsourcing’, *Journal of Purchasing and Supply Management*, 23(4), pp. 256–267.

Borges, A.F.S. *et al.* (2021) ‘The strategic use of artificial intelligence in the digital era: Systematic literature review and future research directions’, *International Journal of Information Management*, 57, p. 102225.

Castro, R.P.L.D., Armayor, D.P., Gómez, J.M., Mosquera, I.S. and Batista, J.A.D., 2009, September. Semantic supported modeling and orchestration of logistic integrated processes, with focus on supply chain: Framework design. In *International Conference on ICT Innovations* (pp. 285-294). Springer, Berlin, Heidelberg.

Čerka, P., Grigien\.e, J. and Sirbikyt\.e, G.. (2015) ‘Liability for damages caused by artificial intelligence’, *Computer law \& security review*, 31(3), pp. 376–389.

Collin, J., Eloranta, E. and Holmström, J. (2009) ‘How to design the right supply chains for your customers’, *Supply Chain Management: An International Journal* [Preprint].

Dalmolen, S., Moonen, H.M., van Hillegersberg, J., Stoter, A.J.R. and Cornelisse, E., 2015, May. Supply chain orchestration and choreography: Programmable logistics using semantics. *In 2015 4th International Conference on Advanced Logistics and Transport (ICALT)* (pp. 76-81). IEEE.

Gholamian, M.R. and Taghanzadeh, A.H. (2017) ‘Integrated network design of wheat supply chain: A real case of Iran’, *Computers and Electronics in Agriculture*, 140, pp. 139–147.

Han, C. and Zhang, Q. (2021) ‘Optimization of supply chain efficiency management based on machine learning and neural network’, *Neural Computing and Applications*, 33(5), pp. 1419–1433.

Hauser, F., Pomponne, V., Jiang, Z., Lamothe, J. and Benaben, F., 2017, June. Processes orchestration for preventing and managing shortages in a supply chain a dermo-cosmetics use case. *In 2017 International Conference on Engineering, Technology and Innovation* (ICE/ITMC) (pp. 1227-1234). IEEE.

Kim, D.-Y. and Fortado, B. (2021) ‘Outcomes of supply chain dependence asymmetry: a systematic review of the statistical evidence’, *International Journal of Production Research*, 59(19), pp. 5844–5866.

Kitsios, F. and Kamariotou, M. (2021) ‘Artificial intelligence and business strategy towards digital transformation: A research agenda’, *Sustainability*, 13(4), p. 2025.

Luo, T. and Yu, J. (2019) ‘Friends along supply chain and relationship-specific investments’, *Review of Quantitative Finance and Accounting*, 53(3), pp. 895–931.

Mentzer, J.T. *et al.* (2001) ‘Defining supply chain management’, *Journal of Business logistics*, 22(2), pp. 1–25.

Mogale, D.G., Kumar, S.K. and Tiwari, M.K. (2020) ‘Green food supply chain design considering risk and post-harvest losses: A case study’, *Annals of Operations Research*, 295(1), pp. 257–284.

Nayal, K. *et al.* (2021) ‘Are artificial intelligence and machine learning suitable to tackle the COVID-19 impacts? An agriculture supply chain perspective’, *The International Journal of Logistics Management* [Preprint].

Ni, D., Xiao, Z. and Lim, M.K. (2020) ‘A systematic review of the research trends of machine learning in supply chain management’, *International Journal of Machine Learning and Cybernetics*, 11(7), pp. 1463–1482.

Riahi, Y. *et al.* (2021) ‘Artificial intelligence applications in supply chain: A descriptive bibliometric analysis and future research directions’, *Expert Systems with Applications*, 173, p. 114702.

Robinson, J.L. *et al.* (2018) ‘Achieving integration: a dual pathway model of supply chain orientation and organizational identification’, *The International Journal of Logistics Management*, 29(4), pp. 1306–1324.

Song, G. and Song, S. (2021) ‘Fostering supply chain integration in omni-channel retailing through human resource factors: empirical study in China’s market’, *International Journal of Logistics Research and Applications*, 24(1), pp. 1–22.

Tountopoulos, V., Kavakli, E. and Sakellariou, R., 2018, October. Towards a cloud-based controller for data-driven service orchestration in smart manufacturing. *In 2018 Sixth International Conference on Enterprise Systems (ES)* (pp. 96-99). IEEE.

Turkulainen, V. and Swink, M.L. (2017) ‘Supply chain personnel as knowledge resources for innovation—a contingency view’, *Journal of Supply Chain Management*, 53(3), pp. 41–59.

Zhang, D., Pee, L.G. and Cui, L. (2021) ‘Artificial intelligence in E-commerce fulfillment: A case study of resource orchestration at Alibaba’s Smart Warehouse’, *International Journal of Information Management*, 57, p. 102304.

Zhang, S. *et al.* (2016) ‘ha’, *Expert Systems with Applications*, 65, pp. 87–99.