

Benefits and Challenges in Supply Chain Network Design in a Global Context

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DOI: <https://doi.org/10.51584/IJRIAS.2026.11050198>

Received: 02 June 2026; Accepted: 08 June 2026; Published: 15 June 2026

ABSTRACT

The global trade and import-export scenario brings with it considerable ease of doing business but also adds to the complexity of designing optimum supply chain networks. Firms must select a network that is both having a good framework and at the same time offer flexibility in certain areas and aspects as we are currently living in dynamic times where change is the only constant. The challenge is to find that optimum balance between minimizing cost and maximizing revenue/profit while ensuring high quality is sustained. The methodology adopted for this research is to investigate the various models adopted by different firms and analyze their cost benefits attained. The key findings of this research are that it will vary depending on the industry that the firm is operating in, the maturity level of the countries it deals with, the stage at which the firm is in terms of the company lifecycle and also the size of the firm (large, medium or small). The broader implications of my work are to help improve the ecosystem of or pertaining to supply chain network design globally.

INTRODUCTION

The supply chain network design is an ever-evolving phenomenon due to the dynamic times we live in where 'change' is the only constant. Network design has to be done in such a way that first the trial has to happen in a smaller capacity like city-wise and then gradually expand to state level. Subsequently, expand to a national level as each state has different policies so a clear understanding of the ways of doing business is vital. After developing some command over the national level operation, then it is wise to expand internationally with preference given to a single country or maximum 3 countries.

LITERATURE REVIEW

The literature review is as follows.

A dyadic study of mediated power and responsible supply chains; Ying Yang, Biao Yang, Jas Kalra, Junwei Sun; May 20, 2026; Building on power-dependence theory within the broader framework of social exchange theory, this research explores how power dynamics influence supply chain interactions and drive the adoption of responsible supply chain practices. Drawing on empirical data from 17 dyadic interactions involved.

Innovation and Structural Design in Regionalized Supply Chain Networks; Kevin J. Dooley, David C. Novak, Zhaohui Wu; April 22, 2026; In this paper, they have (1) replication, (2) substitution, and (3) reconfiguration, which are distinguished by continuity or change in firm membership and process structures. The archetypes offer a theoretical framework for characterizing how global SNs can transition toward regional configurations

Supply Chain Analysts and Supplier Relationship – Specific Innovation; Mohammed Moshtari, Aline P. Seepma; December 10, 2025; This study empirically examines whether and how supply-chain financial analysts who study both a supplier and its buyer influence supplier relationship-specific innovation. Our main

analysis finds that supplier firms followed by supply-chain analysts generate more relationship-specific patents than other suppliers

Governing Supply Chains for Societal Impact: What can we learn from indigenous African philosophies?; Sherwat Elwan Ibrahim; February 12, 2026; Africa's growing role in global supply chains presents an important opportunity for more socially grounded and context-sensitive research in supply chain management (SCM). Despite its economic and demographic significance, African contexts remain underrepresented in mainstream SCM scholarship, which limits understanding of the continent's diversity, complexity, and social dimensions

Regenerative Supply Chains: A knowledge polycentrism view; Domenico Dentoni; February 24, 2026; The field of regenerative supply chains investigates how companies collaboratively preserve, restore and enhance the social and natural capital from which they procure. However, this field has still not addressed a fundamental question: How do supply chain managers organize the complex knowledge that underpins regeneration? The authors advance a prescriptive theory of knowledge polycentris

ANALYSIS

Mahindra & Mahindra Group comprises automotive, farm equipment, IT and logistics as the key divisions. It has market leadership in utility vehicles and tractors. Has manufacturing plant in USA for tractors and also has assembly plants in Nigeria and Mali in Africa. Exports tractors to Thailand, Indonesia and Phillipines.

Supply chain management for so many countries is major part of the business. Global expansion is key to market development and revenue growth of the firm. Also as a part of the derisking strategy, it is important to not just focus on the domestic market but also the international market as when one country's economy may be down, the firm can rely on other countries' economy. Also, the supply demand equation may come into play as the demand for tractors in a growing economy might be higher than an almost mature economy. The basic supply chain network comprises manufacturing plants, warehouses, shipyard, ships, airport, cargo aircraft, railways, railway stations, large trucks, manpower for all places, documentation (approvals, loading documents, etc). The manufacturing plants are located in Zaheerabad Telengana, Nagpur Maharashtra, Jaipur Rajasthan, Rudrapur Uttarkhand, Rajkot Gujrat. These are strategically located in Southern India, Western India and Northern/Central India. This helps in trucks carrying the tractors to the shipping yards easier. For example, Adani Ports in Gujrat (Mundra, Dahej, Hazari and Tuna) and also Adani Ports in Vizag (Adani Gangavaram Port); these two ports will be close to the Gujrat and Telengana manufacturing plant. Here, the supply chain network design is optimized due to maintaining close proximity to the shipyard thereby saving fuel costs and also truck driver fees. If the tractors are shipped by cargo aircraft, then in the case of the Gujrat manufacturing plant, the Ahmedabad International Airport can serve as a loading point and similarly in the case of Telengana manufacturing plant, the Hyderabad International Airport can serve as the loading point. Here also the supply chain network design works due to proximity from manufacturing plant. Warehouses are where mass scale storage occurs before getting picked up by trucks. These warehouses are located within 10km of the manufacturing plant thereby making it optimal for supply chain network design. We must also factor in the large land required for these warehouses at cheaper cost can only occur in slightly remote areas so that the cost-benefit component is adhered to. Transportation coordination is crucial due to scheduling for which they have enabled software tracking devices with an app that is installed in the drivers' mobile phones. Upgrades to newer transport trucks from Ashok Leyland and Tata Commercial Vehicles. Switching to EV trucks is crucial to saving the environment. These are key components in enhancing supply chain network design. Coming to the international context, if we look at the Asian markets where Mahindra is exporting to then we see Phillipines, Thailand and Indonesia. Each country will have their respective customs department which will have multiple forms. Hence, it is crucial to have a small representative office of Mahindra in these countries or alternatively, set up a local 3rd party firm with which we will have a memorandum of understanding (MOU) as to the duties and responsibilities therein as regards coordinating with local government authorities for obtaining the necessary approvals. Also, the coordination in India with the MEA (ministry of external affairs) is essential. Hence, this will also contribute enormously in the supply chain network design.

It was reflected in the revenue growth in Mahindra and Mahindra annual results as shown in the below table:

Year	Revenue
2025	INR 1,59,211 crore
2024	INR 1,41,374 crore
2023	INR 1,22,000 crore
2022	INR 1,13,000 crore
2021	INR 1,05,000 crore

In similar case with ITC which essentially has several lines of business including FMCG, Hotels, Tobacco, Agriculture and Paper Products. If we just look at the FMCG segment of business, then we can see the following points. The manufacturing plants of FMCG products is in excess of 200 in number. That’s massive. The portfolio of products comprise food and personal care. Some of the specific locations include Mysuru Karnataka, Haridwar Uttarkhand, Pune Maharashtra, Kapurthala Punjab and Madanapalle Andhra Pradesh. From manufacturing plant, it goes to warehouse and then finally to the retail shops (both online and offline). In the case of online retail shops, dark stores play a critical role. The positioning of the dark stores will have significant role in supply chain network design so ITC FMCG division can either participate in getting into the dark stores business directly or alternatively to increase sales of its products develop a consultancy with big quick commerce firms like Blinkit, Zepto and Instamart. In warehouse management, the usage of Autonomous Mobile Robots (AMR), Automated Guided Vehicles (AGV), Automated Storage and Retrieval Systems (AS/RS) and Robotic Arms; is truly playing a huge role in improving supply chain network design. The efficiency has increased dramatically. ITC FMCG exports its products to 70 countries primarily serving US, Canada, Middle East, Australia and several African countries. It exports in the categories of Branded Packaged Foods (Bingo, Yippee, Sunfeast, ready to eat meals and dairy products), Spices (high quality and backward integrated), Aashirwaad Atta, Personal care and stationery. In Nepal the manufacturing unit also exists. The positioning can help a great deal in optimum supply chain network design

Year	Revenue
2025	INR 34000 crore
2024	INR 28533 crore
2023	INR 25899 crore
2022	INR 23578 crore
2021	INR 22000crore

CONCLUSION

The conclusion of this research paper is that the key factors that will give an optimum supply chain network design is to have a broad framework. Flexibility is vital due to the fact that we live in dynamic times where change is the only constant. Use of technology in terms of logistics driver apps and associated software, warehouse robots and AI for automated guided vehicles and automated storage is essential. Also the positioning of manufacturing plants close to the warehouses and shipping ports and airports is crucial

REFERENCE

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