EFFECTIVE USE OF AI IN SUPPLY CHAIN MANAGEMENT

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Abstract
Supply Chain Management (SCM) assists any business organization to compete in the dynamic international market. The objective of SCM is to incorporate activities across and within organizations to provide value addition to customers. Supply chain has a big role to play and companies expect their supply chains to be a source of competitive advantage. Due to Globalisation and downward price pressure, supply chain mapping helps to identify "obstruct points" to enable smooth flow of goods, people and services, while ensuring that the Indian products are globally competitive by reducing the logistics cost, in-turn leading to Reduced carbon footprint. These cost savings will also enable strategic investments in information technology because information technology tools and techniques play a very important role in the performance of SCM. This paper defines SCM and its evolution and analyses the trends of SCM & its future in India. The paper highlights the current issues and challenges of Supply Chain Management in India and will discuss on optimizing with the integration of AI, the delivery of goods, services and information from supplier to customer, thus ensuring an effective supply chain that makes companies more competitive, profitable and sustainable.

Introduction:

Supply chain is needed for various reasons such as improving operations, increasing profits, enhancing customer satisfaction, competitive pressures, increasing globalization and growing complexity. SCM calls for strategic decision- making since it is a shared objective of every function in the chain and also due to its impact on overall costs, profits and market share.

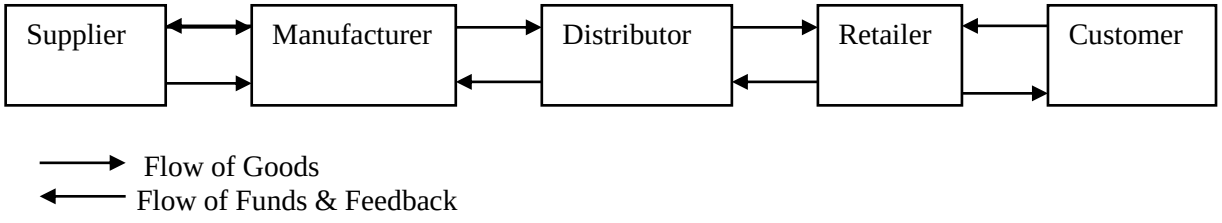
Supply chain consists of different functions such as purchasing, sourcing, production, planning, stores, warehouses, logistics, distributors and dealers. Supply chains are relatively easy to define for manufacturing industries, where each participant in the chain receives inputs from a set of suppliers, processes those inputs, and delivers them to a different set of customers. The major challenge is to build a supply chain with a vision of long-term growth and which is flexible and responsive to handle short term demand variations. Intense competition and global value chains are leading to shifts which are expected in supply chain function.

Indian companies are moving towards making their supply chain and logistics efficient. India's unique operational challenges make such expectations extremely challenging. However there are examples from the Indian industries who have managed to move beyond the constraints and to develop supply chain that lead to competitive advantage.

Supply chain is defined as all the activities involved in delivering a product from raw materials to the customer including sourcing raw materials and parts, manufacturing and assembly, warehousing and inventory tracking, order entry and order management, distribution across all channels, delivery to the customer, and the information systems necessary to monitor all of these activities. SCM coordinates and integrates all of these activities into a seamless process. SCM is defined as the systemic, strategic coordination of the traditional business functions and the tactics across these business functions within a particular organization.

Some authors define SCM in operational terms involving the flow of materials and products, some view it as a management philosophy, some in terms of a management process and others as an integrated system. According to Christopher (1994), a supply chain is "a network of organizations that are involved, through upstream and downstream

linkages, in the different processes and activities that produce value in the form of products and services in the hands of the ultimate customer." An example of a basic supply chain is explained in the below fig 1 by (Chopra and Meindl 2001).



Supply Chain Management (SCM) – Overview

Supply chain management (SCM) helps organizations in efficiently handling their supply chain activities. SCM encompasses the end-to-end coordination and optimization of processes involved in the production, distribution, and delivery of goods and services. It integrates procurement, manufacturing, transportation, warehousing, and logistics for the efficient flow of materials and information from the point of origin to the final consumer. SCM plays a pivotal role in helping organizations respond to market demands, mitigate risks, and gain a competitive edge. SCM applications offer tools to optimize inventory, vendor management, and logistics operations. SCM aids in cost reduction, enhanced customer service, and increased competitiveness for organizations.

India Supply Chain Management (SCM) Market - Industry Trends & Forecast Report, 2030

India Supply Chain Management (SCM) Market size was estimated at USD 3,421.17 million in 2023. During the forecast period between 2024 and 2030, the size of India Supply Chain Management (SCM) Market is projected to grow at a CAGR of 11.1% reaching a value of USD 6,433.24 million by 2030. Major growth drivers for the India Supply Chain Management (SCM) Market include the increasing adoption of technology solutions aimed at streamlining supply chain operations by local companies. This adoption is fueled by the imperative for improved visibility, agility, and cost optimization within supply chain management, addressing the mounting complexity of supply chain networks. Companies across diverse industries are increasingly embracing SCMS solutions to achieve real-time tracking and monitoring of goods. Prominent trends in the Indian SCMS market include a notable shift towards cloud-based solutions, driven by the desire for scalability, flexibility, and cost-effectiveness, aimed at reducing IT infrastructure costs and enhancing overall supply chain operations. Also, a noteworthy trend involves the integration of artificial intelligence (AI) and machine learning (ML) technologies into SCMS solutions to optimize operations, predict demand, identify potential disruptions, and optimize inventory levels. The Indian SCMS market exhibits the presence of both local and global players, with local providers offering customized solutions tailored to the specific needs of Indian companies. Amidst these trends, macroeconomic factors, including steady economic growth, government initiatives such as 'Make in India' and 'Digital India,' the expanding e-commerce sector, and the growth of the retail industry collectively contribute to the sustained and growing demand for SCMS solutions in India.

Source: BlueWeave Consulting

Government's Supportive Initiatives

The surge in government initiatives is propelling significant growth in the Indian Supply Chain Management (SCM) Market. India, recognized as one of the fastest-growing global economies, has witnessed a real GDP growth estimated at 7.2% during 2022-23. With an emphasis on improving the overall supply chain landscape, the government is undertaking bold measures, including enhancing transportation infrastructure like roads and ports, to ensure more efficient movement of goods and services. This strategic focus aligns with the broader goal of creating a world-class supply chain ecosystem. Furthermore, concerted efforts to enhance the ease of doing business, coupled with investments in Skill India and Make in India

initiatives, are contributing to India's positioning as a global leader in SCM. As the government actively fosters an enabling environment, supply chain managers are presented with a unique opportunity to optimize operations, leverage India's strengths in technology and a skilled workforce, and navigate the evolving regulatory landscape. The rising tide of government-backed initiatives underscores the transformative potential within the India Supply Chain Management (SCM) Market, paving the way for sustained growth and innovation during the forecast period.

How does AI effective in supply chain work?

Supply chain systems powered by AI are helping companies optimize routes, streamline workflows, improve procurement, minimize shortages and automate tasks end-to-end.

A supply chain can become complicated, especially for manufacturers of goods who oftentimes rely on their partners to ship their goods in a timely and organized fashion. AI can keep all parts of a supply chain in balance with its ability to find patterns and relationships unlike a traditional non-AI system. These patterns can help optimize logistics networks all the way from the warehouse to cargo freighters to distribution centers.

Modern supply chains are expansive and require thorough oversight to avoid unnecessary disruptions. AI systems can offer assistance in forecasting, such as demand planning or being able to predict production and warehouse capacity based on customer demand. Some are using AI to gain insights from a broader data set collected from Internet of Things (IoT) devices deployed across the supply chain.

AI can also be used in supply chain operations for tracking inventory levels and market trends. In inventory management, AI can enhance supply chain visibility, automate documentation for physical goods and intelligently enter data whenever items change hands.

Benefits of AI in supply chains

An AI-powered supply chain has many potential benefits for building supply chain resilience and a stronger base for manufacturers.

Lower operating costs

AI can learn and understand complex behaviors and can learn repetitive tasks, such as tracking inventory, and complete them quickly and accurately. AI solutions can reduce overall operating costs by identifying inefficiencies and mitigating bottlenecks.

Advanced real-time decisions

AI uses historical and real-time data to make real-time decisions, oftentimes with conversational answers. AI processes the data and can analyze the root of the problem and suggest a solution, in that moment.

Cut down on errors and waste

One of the benefits of AI technology is its ability to spot behaviors and patterns. By doing so, manufacturers and warehouse operators can train algorithms to find flaws, such as employee errors and product defects, long before bigger mistakes are made. Furthermore, AI can help streamline an ERP framework and can be directly embedded.

More tailored inventory management

As previously discussed, AI can help forecast demand with its extensive use of inventory information. It can help manufacturers and supply chain managers gauge a customer's interest in a product and determine whether a customer's demand is rising or falling and adjust accordingly. It can aid in a manufacturer's decision-making process and improve the accuracy of demand forecasting.

Improved warehouse efficiency

AI, specifically ML models, helps lay out warehouses more efficiently by being able to evaluate the quantity of materials coming in and improve service levels. The AI system can also plan the optimal routes for machinery and for workers and be an overall warehouse management powerhouse.

Better supply chain sustainability

By using the predictive analytics that AI offers, companies are able to make supply chains more sustainable and better for the environment. Manufacturers can use AI and ML models to optimize truckloads, predict the most efficient delivery routes and reduce product waste in the marketplace.

Optimized operations through simulation

Supply chain managers are always looking to better understand their operation. With AI-powered simulations, they're able to not only gain insight, but also understand and find ways to improve. AI, working alongside digital twins, can visualize potential supply chain disruptions and visualize through 2D visual models external processes that might create unnecessary downtime.

Challenges of AI in supply chain

AI implementation can be complicated, and businesses should understand the challenges and risks of introducing this new technology.

Downtime for training

Anytime a company brings in a new technology, they need to train the individuals who will be interacting with it at any level. Due to this

necessity, downtime is likely to occur, so it's best to prepare and schedule accordingly to limit disruptions. All supply chain professionals should be aware of potential downtime and be transparent with partners that it might occur.

Startup costs

There are several cost considerations in implementing AI. Along with the cost of the software to run the system, machine learning models are also an expense to consider. Some come prebuilt or can be built from scratch, if the company prefers that option. Either way, it's important to train the model on your own clean, historical data before inputting AI algorithms.

Complex systems

The work doesn't stop as soon as the AI has been implemented. An AI system at a global scale is complex and requires supply chain planners to constantly stay on top of how the tools are performing and fine-tune as needed.

AI risks

There are three common risks when integrating AI in supply chains:

Inaccuracy of data

AI is built and generated from large amounts of data found from a range of sources. Due to the nature of the origin of the data, inaccuracies and bias might be present, which would result in the spread of misinformation. For that reason, AI requires human review to ensure that the data is fair, unbiased and explainable.

Overreliance on AI

Human interaction should be the superior solution and the key expert in managing and handling supply chain risks. AI is a tool; it cannot build relationships. There is a misconception that AI can replace human intelligence, but in fact, AI should *augment* it. Furthermore, if the technology fails, humans with expertise must keep the supply chain running.

Security and privacy vulnerabilities

The increased collection and use of customer data for AI models also increases the risks of surveillance, hacking and cyber attacks. Businesses must prioritize and safeguard consumers' privacy and data rights, providing explicit assurances about how data is used and protected.

Steps to prepare a supply chain for AI

Conclusion

This paper has outlined the supply chain practices followed by Indian organizations giving coverage to three dimensions namely, supply chain strategy, supply chain integration, and supply chain success. Indian organizations should further align supply chain strategy with business strategy in order to deliver highest customer satisfaction, streamline processes for supply chain integration to achieve operational excellence, and form partnerships to minimize inventory and maximize profits. In order to achieve this, the power of AI Technology has to be incorporated. The study may help the Indian industry to benchmark their supply chain practices with respect to other developing/developed economies. Supply chains must similarly get the maximum value in their areas of excellence, while carefully avoiding exposing their weaknesses. It involves a dual strategy of fostering trust as well as optimizing resources, performance and gains across the supply chain. Successfully accomplishing this twin-objective, requires a reciprocal and continuing commitment of human, technical, and informational resources on the part of supply chain partners.

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