ARTIFICIAL INTELLIGENCE IN LOGISTICS AND SUPPLY CHAIN MANAGEMENT ETHICAL IMPLICATIONS IN AUTOMATION, TRANSPARENCY & SUSTAINABILITY

Volume - I

Editors in Chief

Dr. D. Divya | Dr. G. Vignesh

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Artificial Intelligence in Logistics and Supply Chain Management Ethical Implications in Automation, Transparency & Sustainability

Editors in Chief: **Dr. D. Divya**
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FUTURE OF AI IN THE SUPPLY CHAIN

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Abstract

Like many industries, the supply chain world is being transformed by artificial intelligence (AI). AI excels at handling massive amounts of data, making predictions, and connecting multiple data sources — tasks that supply chain managers rely on in an increasingly complex field. AI can easily handle these demands and tackle some of the biggest challenges in supply chain management. Research from McKinsey found that early adopters of AI improved logistics costs by 15%, service levels by 65%, and inventory levels by 35% compared to slow-moving competitors. The benefits of artificial intelligence in supply chain management are extensive and likely to grow in the future. Artificial intelligence isn't a cure-all for all of the supply chain's woes, but it does hold great potential to alleviate some of its biggest challenges; for companies that are able to invest and position their business to unlock the potential of AI in the supply chain, the technology can provide a distinct competitive advantage. "Every single company right now needs to be able to react in a quick manner. They need to adapt faster to the ever-changing world," Luis Gonzalez, Becle global supply chain director, tells CGT. "And every single day there's an increase in the complexity of their supply chain. There is no other way for the companies to survive and to adapt quickly to those changes than to automate processes, and to convert manual processes from humans making decisions" to one in which machines are supervised by humans. This paper will explores the insights of Future of AI in Supply chain and its application in supply chain activities.

Keywords: *Artificial intelligence, supply chain management, challenges, competitive advantage*

Introduction

AI, is rapidly transforming how we live and work, leading to unprecedented changes across virtually all industries. The global supply chain is no exception, and as AI tools become more advanced and integrated, businesses in the supply chain are taking advantage of this groundbreaking technology. Today, AI is already helping businesses in the supply chain handle complex challenges, and is increasing their efficiency, accuracy, and resilience. But what does the future of AI in supply chains look like?

Artificial intelligence is essential for supply chain businesses looking to stay ahead of the competition, meet customer expectations, and pivot at the pace of modern business. But because this technology is rapidly changing, it's important to understand where it is today and monitor where it's heading.Modern supply chains are complex networks of interconnected processes. Global disruptions, faster commerce, and evolving customer expectations have made managing supply chains more challenging than ever. AI offers part of the solution by providing new ways to optimize operations, improve efficiency, and enhance customer satisfaction. The crux of the presentation was the idea that AI, including generative AI in supply chain applications, can revolutionize many areas of a business. The scope is broad and the opportunities are vast.

Application of AI in Supply Chain Activities

In looking at the future of AI in the CPG supply chain, it's helpful to first understand some of the ways the technology can be used. For companies with unlimited resources, artificial

intelligence could be applied to nearly every link in the supply chain. Managing the end-to-end supply chain requires dealing with huge amounts of data that are generated from various sources and parties. As supply chains only grow in their complexity, AI and machine learning can be applied to help identify patterns in data at speeds that humans are unable to, enabling organizations to take proactive measures. What's more, as consumer goods companies navigate a large variety of global regulations, including those for sustainability and ethical labor practices, transparency is critical, and supply chain technology is a key enabler.

"The use of full artificial intelligence would be valuable in identifying where to apply pattern recognition in the first place, potentially finding and fixing supply chain issues that are less obvious to humans, and identifying true root causes of issues where the human targeting method may be simply looking at another symptom in the chain," says Lindsey Peters, retail and consumer goods lead at Celonis. Among the ways that consumer goods leaders can apply AI in their supply chains include:

Demand forecasting and planning: Companies can generate forecasts from disparate historical data sets to predict the type of volume of products they should manufacture.

Risk management: AI can be used to quickly analyze vast amounts of data to navigate and avoid the impacts of risks such as weather delays, maintenance downtime, and product quality issues.

Supplier selection: AI can analyze past performance and reliability of particular suppliers and make recommendations based on findings.

An example: Luxury brand Karl Lagerfeld is using artificial intelligence to automate allocation across its network in order to expedite the planning process, reduce inaccuracies, and fine-tune forecasts to optimize stock placement.

Future Technology of Supply Chain Management

While you can't solve all challenges by simply layering on technology, a modern supply chain strategy requires an up-to-date tech stack. For companies seeking to transform their supply chains into a competitive advantage, technology like AI and machine learning can be a key enabler and a fixture in the future trends of supply chain management.

The global supply chain has been hammered by ongoing disruption, notes Adheer Bahulkar, global supply chain lead of Accenture's consumer goods and industry practice. As a result, today's consumer goods companies want to boost their inventory, processes, capacity, and more. Artificial intelligence in supply chain management can facilitate all of these things.

"The challenge now is to cut high costs while continuing to build more resilient supply chain networks," he says, and the focus for CPG leaders today is creating hyper-automation at scale. "This includes robotics capable of complete situational awareness that ultimately strive towards self-monitoring, self-learning, and self-correcting physical processes from manufacturing to warehousing and transportation," says Bahulkar.

Future of supply chains in 2028

Legacy supply chains for consumer goods companies remain very linear and predictable, notes Bahulkar, and significant demand fragmentation from shifting digital commerce and fulfillment models — not to mention consumer demand for increased customization, personalization, and localized assortments -— will render these legacy chains obsolete,

And while no one has a crystal ball for the future of the supply chain for the next five to 10 years, it's likely that artificial intelligence will play a leading role in helping fuel resilience.

We can expect to see a rise in end-to-end visibility with more interconnected systems, increased use of AI and ML for demand forecasting, and more sustainable practices driven by consumer demand, according to Dr. Ilya Jackson, postdoctoral associate at the MIT Center for Transportation and Logistics. "In 10 years, supply chains could be highly autonomous, with AI-driven systems managing much of the processes, from procurement to delivery. Furthermore, the concept of the circular economy might be more widely adopted, minimizing waste and maximizing resource efficiency."

"Successful consumer goods companies will be those that convert their supply chains into value networks by investing in transforming them for growth," stresses Bahulkar. "It requires evolving to holistic physical and process automation as well as embracing new business models, shared supply chains and strategically leverage supply chain-as-a-service where it makes sense."

Three technologies that are reinventing the supply chain

1. **Digital twins:** Digital twins are virtual replications of processes, systems, physical products, or even customers, which companies can use to identify global supply chain disruption in advance. They are particularly valued within the consumer goods supply chain thanks to their ability to proactively pinpoint disruption, thereby reducing risk.
1. When asked about their current and future supply chain innovation plans, 21% of retailers and consumer goods manufacturers in a November 2022 CGT/EnsembleIQ study said they had already implemented digital twins while another 24% planned to add them. Thirty-four percent said they didn't have any plans to add them but wanted to learn more, and 21% said they weren't interested or didn't know (or it wasn't applicable to them).
2. **Robotic Process Automation (RPA):** RPA is a broad term used to describe the automation of business processes. John Harmon, CFA, managing director of technology research at Coresight Research, expects that AI-powered warehouse systems will be increasingly used to validate and dispatch product orders, track shipments, and gather customer feedback. "Over time, learning from vast sets of real-world data and scenarios, as well as synthetic data (artificial datasets created to advance AI learning algorithms), AI-enhanced automation systems and robotics may entirely eliminate human error, with warehouses operating autonomously and at peak efficiency," he writes.
3. **IoT:** While the Internet of Things (IoT) isn't new, it's still gaining traction in gaining widespread adoption across the supply chain. Technology advancements continue to propel this technology forward. "While it has optimized supply chains [to] track/trace for decades now, the massive leaps forward in miniaturization and precision in this space have resulted in massive increases in the amount of data generated to monitor and track items moving throughthe supply chain," says Celonis' Peters.

Honorable mention: Blockchain

While blockchain isn't quite the supply chain savior some thought it once would be, many consumer goods companies are leveraging it for benefits across their supply chains. For example, Unilever teamed with SAP for a proof of concept in Indonesia to source more than 188,000 tons

of oil palm fruit. Suppliers created tokens mirroring the flow of palm oil through the supply chain and captured the unique attributes of the oil's origin. This enabled Unilever to identify the percentage of palm oil products they purchased from a sustainable origin and track it to the end consumer product.

Retailers are also exploring the use of blockchain technology in supply chain. Walmart Canada partnered with DLT Labs to automate freight and payment data. A blockchain-based freight and payment network manages, integrates, and synchronizes all the supply chain and logistics data in real-time, aggregating the data between Walmart Canada and its fleet of third-party trucks on a shared ledger. In addition to automating the calculations for real-time invoicing, payments, and settlement, it also integrates with each company's legacy systems.

Emerging Technologies in Supply Chain

Generative AI is still too new to make its way on the above trio of technologies reinventing the supply chain, but it's certainly finding its way into the same conversations. Current perspectives on the potential of generative AI in supply chain remain mixed.

For her part, Amber Salley, Gartner senior director analyst, Gartner, tells CGT she doesn't yet see strong applicability for tools like ChatGPT across the supply chain; however, that doesn't mean it doesn't have broader use that could impact the supply chain, such as in the course of SLP or planning. "You might say, 'If I increase trade promotion spend by X percent in this market, what does that mean for how much inventory should be stocked across the network?' And then get some kind of response back for that" from the tools.

Adheer Bahulkar, global supply chain lead of Accenture's consumer goods and industry practice, is more optimistic, though careful to note that generative AI is just another branch in the AI spectrum. The technology will impact tasks rather than occupations, he says, with some tasks transformed and automated — and others unaffected.

"When embedded into the enterprise digital core — which includes cloud, data, security, and machine learning — generative AI has the ability to transform and optimize tasks, manage data, create faster insights, innovate with new experiences, augment workers, and connect and communicate with customers and consumers," he notes. "With an exponential increase in computing power and continuous learning, generative AI models can scan and query internal and external data, curate relevant pieces of contextualized information."

"We've all seen how effective ChatGPT can be at conversing, answering questions, and summarizing information in a natural, engaging, and relevant way," adds Bahulkar. "It's easy to see how this could be extended to supply chain — responding to queries, helping to create new procurement contracts, offering recommendations, and more."

Future of AI in Supply Chain

So if the future of the supply chain includes a need for both more automation and more granularity — a very tall order — what's the future of AI in the supply chain?

Similarly, the future of AI in the supply chain revolves around further automation and precision, notes Jackson. "This includes autonomous vehicles for transport, advanced demand forecasting using machine learning algorithms, more effective inventory management using AI-powered prediction tools, and enhanced customer service with AI chatbots."

Keith Moore, CEO of AutoScheduler, a provider of warehouse resource planning and optimization technology, expects artificial intelligence will extend beyond discrete vertical applications in warehousing, transportation, and planning to begin to connect full source to delivery processes and the decision-making throughout.

Artificial intelligence will change the supply chain

"AI will provide an intimate relationship to how we do everything, including managing supply chains," summarizes Larry Sherrod, senior manager at Peloton Consulting Group.

AI requires investment, but it carries the potential to transform the supply chain by making it more traceable, resilient, and collaborative.

"AI has the exciting potential to democratize technology used to solve supply chain issues by making it more conversational, and not just understandable for technical users," says Peters. "In turn, it will enable supply chain professionals to make more informed decisions based on the digestible information available to them. It will also transform roles such as supply and demand planners to work smarter, not harder."

Conclusion

While the adoption of artificial intelligence in logistics and supply chain will continue to expand across the consumer goods industry, it's not necessary for all processes and environments. And even when the benefits of AI in supply chain are transformative, most experts are united in the opinion that applications should still be human-led.

"Some supply chain activities like merchandising are still largely done in Excel. It seems unlikely that we'll move from the highly manual environment we are in today to an AI-run end-to-end solution in the next decade, especially when having clean data will be key," notes Peters.

"In the end, supply chains are human networks. Ultimately supply [chains] are made of people who make, store, move, contract, and communicate — all augmented by increasingly powerful technologies. And technology is an augmenting force for many of the uniquely human qualities, not a replacement force," says MIT Professor Yossi Sheffi.

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