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Emerging Supply Chain Trends

-What It Takes to Launch a Mission: The Invisible Supply Chains Behind the NASA Artemis Program

Written By : Abiola Oyekan

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What It Takes to Launch a Mission: The Invisible Supply Chains Behind the NASA Artemis Program

Introduction: The Tip of the Iceberg

A rocket launch is the tip of the iceberg. On April 1, 2026, when NASA's Artemis II mission lifted off from Launch Complex 39B at Kennedy Space Center at 6:35 p.m. EDT, the world watched four astronauts—Reid Wiseman, Victor Glover, Christina Koch, and Jeremy Hansen—begin their 10-day journey around the Moon. The Space Launch System (SLS) rocket roared to life, the Orion spacecraft soared skyward, and the mission appeared seamless. It marked the first crewed journey toward the Moon in over 50 years—an achievement of engineering brilliance, human courage, and scientific ambition.

Behind every successful launch lies an invisible system—vast, complex, and meticulously coordinated. This system is the supply chain. It is the quiet force that ensures that thousands of components, sourced from across the globe, come together at the right place, at the right time, and in perfect condition. Without it, even the most advanced rocket would never leave the ground.

The Journey of a Single Component

To understand the magnitude of this effort, consider the journey of a single component—perhaps a specialized sensor embedded within the Orion spacecraft. Its journey begins not at Kennedy Space Center, but perhaps it may begin its life in a small manufacturing facility in Europe or the United States, produced by a highly specialized supplier. Before it ever reaches Florida, it undergoes rigorous testing and certification, ensuring it meets the extreme demands of spaceflight—radiation exposure, temperature fluctuations, and mechanical stress.

Once approved, the component is transported under tightly controlled conditions to a larger assembly facility. Here, it is integrated into a subsystem, which is then incorporated into the Orion spacecraft. Every step of this process is tracked through what engineers call a “digital thread”—a continuous record that documents the component’s design, testing, handling, and installation. This level of traceability is not optional. In a mission like Artemis II, where human lives are at stake, even a minor defect—a faulty bolt or mislabeled part—could have catastrophic consequences, jeopardising the entire $4 billion mission and the lives of four astronauts. Only after clearing every checkpoint does this tiny piece integrate into the massive SLS or Orion structure, finally becoming part of a 322-foot rocket.The supply chain ensures that every piece, no matter how small, meets the highest standards of quality and reliability.

The Network Behind the Mission

Now multiply that single component by tens of thousands. The Artemis II mission relies on a network of more than 2,700 suppliers spanning the United States and Europe. These suppliers produce everything from advanced propulsion systems and avionics to wiring, insulation, and structural materials. Together, they form a highly interconnected ecosystem, where each contributor plays a critical role in the final outcome. This network is not just large—it is deeply interdependent. A delay in one component can cascade through the entire system, affecting assembly schedules, testing timelines, and ultimately the launch date. Managing such complexity requires more than logistics; it requires strategic coordination at a global scale.

International collaboration further amplifies this complexity. For example, major components are developed through partnerships with global aerospace firms, requiring strict adherence to shared standards and seamless integration across borders. The European Service Module, for instance, comes from Airbus. Core stages are assembled by Boeing and Lockheed Martin. Thousands of small vendors contribute specialized alloys, seals, valves, and chips. This is where frameworks like the Artemis Accords play a stabilizing role, enabling interoperability, transparency, and coordination among partners. In essence, the Artemis II mission is not built in one place—it is assembled from the collective capabilities of a global industrial network.

Challenges Along the Way

Despite its sophistication, the supply chain behind Artemis II is not immune to disruption. In recent years, aerospace supply chains have faced significant challenges, including geopolitical tensions, labor shortages, and material constraints. These disruptions can create bottlenecks, delaying the delivery of critical components and increasing costs. NASA has had to adopt proactive strategies to mitigate these risks. One such approach is multi-sourcing—ensuring that critical components are not dependent on a single supplier. This reduces the risk of "single points of failure," where the absence of one vendor could halt the entire mission. Another challenge lies in visibility. According to oversight reports, supply chain issues are sometimes identified late in the process, forcing reactive solutions rather than preventive action. This can lead to schedule delays and cost overruns in a mission already estimated at approximately $4 billion. Logistics also presents unique challenges. Transporting a 322-foot rocket is far from conventional. Specialized systems, such as NASA's Crawler-Transporter 2, are used to move delicate structures from assembly buildings to the launch pad without causing structural damage. This requires precision engineering and meticulous planning. Ultimately, the success of Artemis II depended on navigating these challenges while maintaining uncompromising standards of safety and reliability.

Human and Organizational Coordination

While technology and infrastructure are critical, the true backbone of the Artemis supply chain is human coordination. Thousands of engineers, project managers, logistics experts, and technicians work in synchrony to ensure that every component is designed, delivered, and integrated seamlessly. This requires not only technical expertise but also strong communication, trust, and leadership across organizations. Coordination extends across multiple levels—from small suppliers producing niche components to major contractors responsible for entire systems. Each participant must align with shared timelines, quality standards, and mission objectives. Digital tools play a crucial role in enabling this coordination. Real-time data systems, tracking platforms, and integrated planning tools allow teams to monitor progress, identify risks, and make informed decisions. However, these tools are only as effective as the people who use them. In a mission as complex as Artemis II, success is not just about managing parts—it is about managing relationships, expectations, and collective effort.

Conclusion: The Invisible Engine of Exploration

When the Artemis II rocket lifted off, it represented more than a technological milestone—it was the culmination of an extraordinary logistical achievement. Supply chain management transformed a collection of over 20,000 individual parts into a flight-ready spacecraft capable of carrying humans around the Moon. It ensured that every component, every connection, and every system worked in harmony. As humanity looks toward deeper space exploration—including future missions to Mars—the importance of these invisible systems will only grow. The next era of discovery will not be driven by engineering alone, but by the ability to coordinate complex, global networks with precision and resilience. In the end, the success of Artemis II reminds us of a simple but profound truth: before we can explore the stars, we must first master the systems that make exploration possible.

Written By: Abiola Oyekan

The AI-Powered Supply Chain: From Reactive to Predictive — What It Means for Africa and the Global South

The Shift That Is Already Happening

Supply chain management, for most of its history, has been a discipline of response. Organisations faced supply chain disruption as a result of port closure, supplier failure, demand spike and mobilised resources to contain the damage. The supply chain discipline built its frameworks and safety stock models and risk registers on the logic of reaction. The paradigm is now undergoing its most fundamental transformation in decades, driven by a convergence of artificial intelligence, real-time data infrastructure, and predictive analytics that is reshaping what is operationally possible.

This is especially relevant for actors in the supply chain (such as professionals, researchers, and policymakers) in Africa and the Global South, where supply chain fragility has historically translated directly into lost economic output, food insecurity, and underdevelopment. Recognising these technological trends not on the side-lines, but as active participants in shaping how they are deployed is one of the most urgent challenges and opportunities facing our community in the moment.

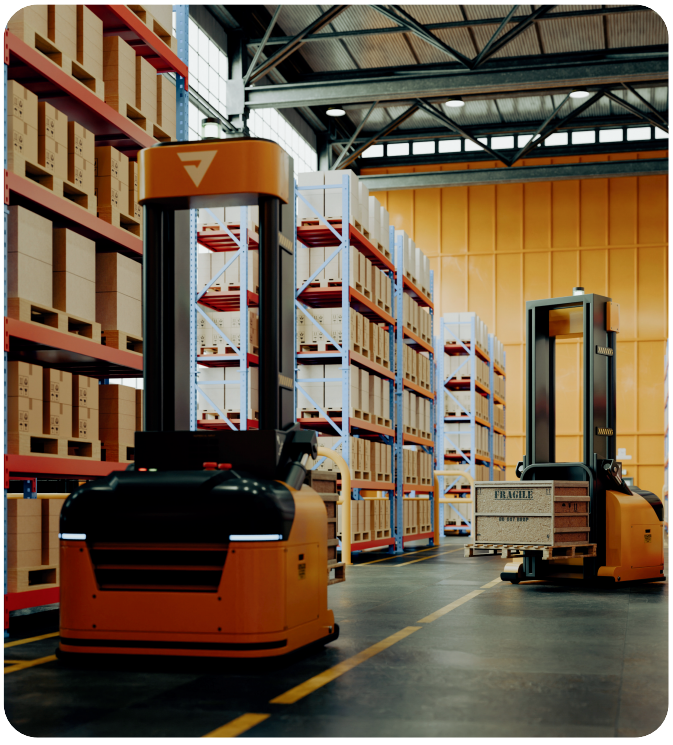
"The question for African supply chain professionals is not whether AI will transform procurement and logistics. It already is. The question is who shapes that transformation and on whose terms."

What AI Is Actually Doing to Supply Chains

There are numerous pathways through which artificial intelligence (AI) has penetrated the supply chain industry, each with an independent implication for efficiency, resilience, and equity. The first and oldest application is demand forecasting. Traditional forecasts were based on past sales data processed using statistical models. The use of AI forecasts that combine data from point-of-sale, weather, social media analysis, macroeconomic signals, and supplier lead-time variability in real time can forecast demand orders of magnitude more accurately than ever before. Retailers in developed markets have reported demand forecast error reductions of 30 to 50 percent following AI adoption, leading to significant reductions in both stock outs and excess inventory.

The second pathway comprises procurement intelligence. AI systems now scan supplier databases, monitor geopolitical risk signals, track commodity price movements, and flag potential supply disruptions before they materialise in operational failures. Procurement teams employing AI-assisted supplier risk monitoring can identify secondary and tertiary supplier vulnerabilities that traditional risk management frameworks would miss entirely—which is critical in a world where the COVID-19 pandemic laid bare the latent depth of interconnected supply chains worldwide.

The third pathway, and likely the most radical of logistics-intensive economies, involves optimising routes and predictive logistics. In today's scenario machine learning models deal with real-time traffic information, port congestion signals, customs clearance times, and carrier performance histories to iteratively improve last-mile and cross-border delivery decisions, which is more challenging than ever before. Companies deploying these mechanisms report logistics cost reductions of 15 to 25% — huge in any context, but revolutionary in African trading corridors where logistics cost rates are among the highest in the world as a proportion of product value.



The African Opportunity and the African Challenge

In the context of AI-enhanced supply chain transformation within the African context there is an emergence of a fundamental paradox. On the one hand, the continent faces precisely the circumstances that AI-enabled resilience instruments drive the most benefits: volatile demand environments, fragmented logistics infrastructure, limited supplier visibility, high exposure to climate and geopolitical shocks, and large informal economic sectors for which conventional supply chain systems struggle to serve. The prospects of AI-driven supply chain optimisation through African agriculture, manufacturing, and cross-border trade are enormous and largely unrealised.

Conversely, the enabling conditions for AI adoption namely, reliable digital infrastructure, structured data environments, specialised technical talent, and adequate financial capital for technology investment—are unevenly distributed across the continent. AI systems' performance in supply chain contexts is inherently contingent upon the quality and completeness of the training data. In operational environments where supply chain data are sparse, inconsistently recorded, or embedded within legacy systems that lack interoperability with contemporary analytics platforms, the trajectory toward AI-enabled supply chain operations remains neither straightforward nor cost-efficient.

KEY TRENDS AT A GLANCE

- AI demand forecasting reduces error rates by 30-50% in mature deployments
- Predictive supplier risk monitoring surfaces Tier 2 and Tier 3 vulnerabilities
- Route optimisation cutting logistics costs by 15-25% in pilot programmes
- African logistics costs remain 2-3x higher than global averages as a share of product value
- Generative AI entering procurement with contract analysis and specification drafting
- Agentic AI systems beginning to execute procurement decisions autonomously

Generative AI: The Next Frontier in Procurement

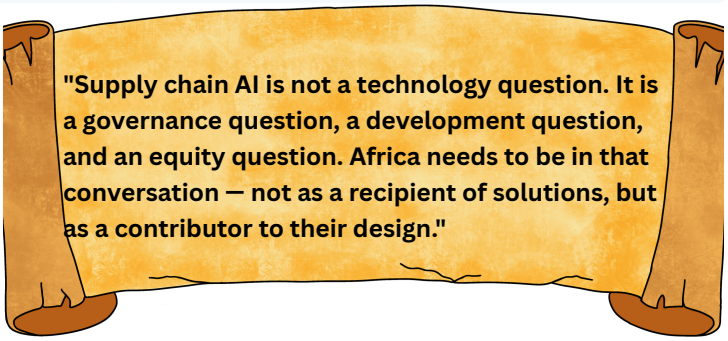
So while machine learning and predictive analytics have reinvented how supply chains work for years, generative AI is making its way into procurement in ways we may not have foreseen even five years ago. Large language models (LLM) are being used to analyse and compare complex supplier contracts, spotting deviations from standard terms and unfavourable conditions within seconds rather than hours. They are drafting procurement specifications, generating supplier questionnaires, and summarising supplier sustainability disclosures for ESG compliance teams.

Most strikingly, agentic AI (AI that not only analyses but also takes actions, initiates workflows, and executes decisions within defined parameters) is creating the increasingly ambiguous relationship between human and automated decision-making in supply chain management. Autonomous procurement agents that are able to manage tenders, evaluate responses against pre-set criteria, and issue purchase orders within approved parameters are no longer hypothetical. They are in pilot deployment at leading multinationals. For all supply chain professionals, this raises challenging, immediate and urgent questions concerning the evolution of roles, competencies and governance frameworks in our industry.

What This Means for Supply Chain Education and Research

The AI supply chain transformation presents both a curriculum challenge and a research opportunity for educators and researchers. Supply chain programmes that do not integrate data literacy, AI fundamentals, and digital procurement competencies are preparing graduates for a world that is already changing beneath them. At the same time, the field urgently needs research that goes beyond enthusiasm and examines the actual conditions under which AI supply chain tools deliver value — and those under which they fail, create new vulnerabilities, or exacerbate inequalities between large and small supply chain actors.

Insights on the adoption of AI in African and emerging-economy supply chains is particularly scarce. We call for evidence-based research that investigates what sets of AI applications offer the highest value in data scarcity, what kind of institutional and infrastructure conditions are needed in order for AI technologies to work correctly, and how small and medium businesses can access AI-enabled supply chain capabilities without the same capital investments used by global companies. These are not peripheral questions. They are central to whether the AI supply chain revolution works for the communities our industry is ultimately here to champion.



Practical Steps for Practitioners

There are priorities to action on in the short term to prepare organisations to use AI's advanced supply chain capabilities in their businesses. First, invest in data infrastructure, and only then invest in AI. AI software developed using inferior, messy, or poorly organised supply chain data is going to do a bad job and it can actually deceive the decision makers. Data cleaning, standardisation, and integration across procurement, inventory, and logistics systems is foundational work that must occur before AI is introduced.

Second, we recommend a staged approach to adoption, with phased rollout of targeted pilot applications leading to a strategic shift, rather than across the entire business enterprise. Examples might consist in implementing AI-driven demand forecasting for a single product category, deploying AI-assisted supplier risk monitoring for a critical commodity, or optimizing route planning on a particular logistics corridor. The bounded use cases can then lead to actionable learning which can become a proof-of-concept business case and to large-scale investment decisions later.

Third, AI procurement-specific governance dimensions should be tackled at the outset. The introduction of autonomous or semi-autonomous procurement decision-making creates gaps in accountability that existing procurement governance frameworks are inherently unprepared to fill. As such, governance architectures integrating human oversight mechanisms and transparent, auditable transaction trails are not to be dismissed as bureaucratic overhead — they are fundamental for risk management in AI-mediated supply chain operations.

The supply chain powered by AI is not far off. It is an emerging and unevenly evolving reality with real and serious implications, a situation in which our profession has a professional obligation to understand, shape, and evaluate. The Advance Institute for Supply Chain Research is committed to developing the knowledge, talent, and analytical frameworks necessary for supply chain professionals to navigate this transformation with confidence and purpose.

About the Author

Ernest Mugoni, PhD is a faculty member in Supply Chain Management at Marondera University of Agricultural Sciences and Technology, Zimbabwe. His research interests include sustainable supply chain governance, sustainable supply chain management, reverse logistics, supply chain digital transformation, emerging technologies in supply chain, circular economy implementation in emerging markets, and the institutional dimensions of supply chain transformation in African contexts. He welcomes correspondence from practitioners and researchers working on related and multidisciplinary areas: ernmugoni@gmail.com.

EMERGING TRENDS IN SUPPLY CHAIN

Supply chain is the backbone of the world trade. Goods are being transported from different countries. Without Supply chain, economies stop. During covid 19, we saw how critical Logistics was in delivering vaccines.

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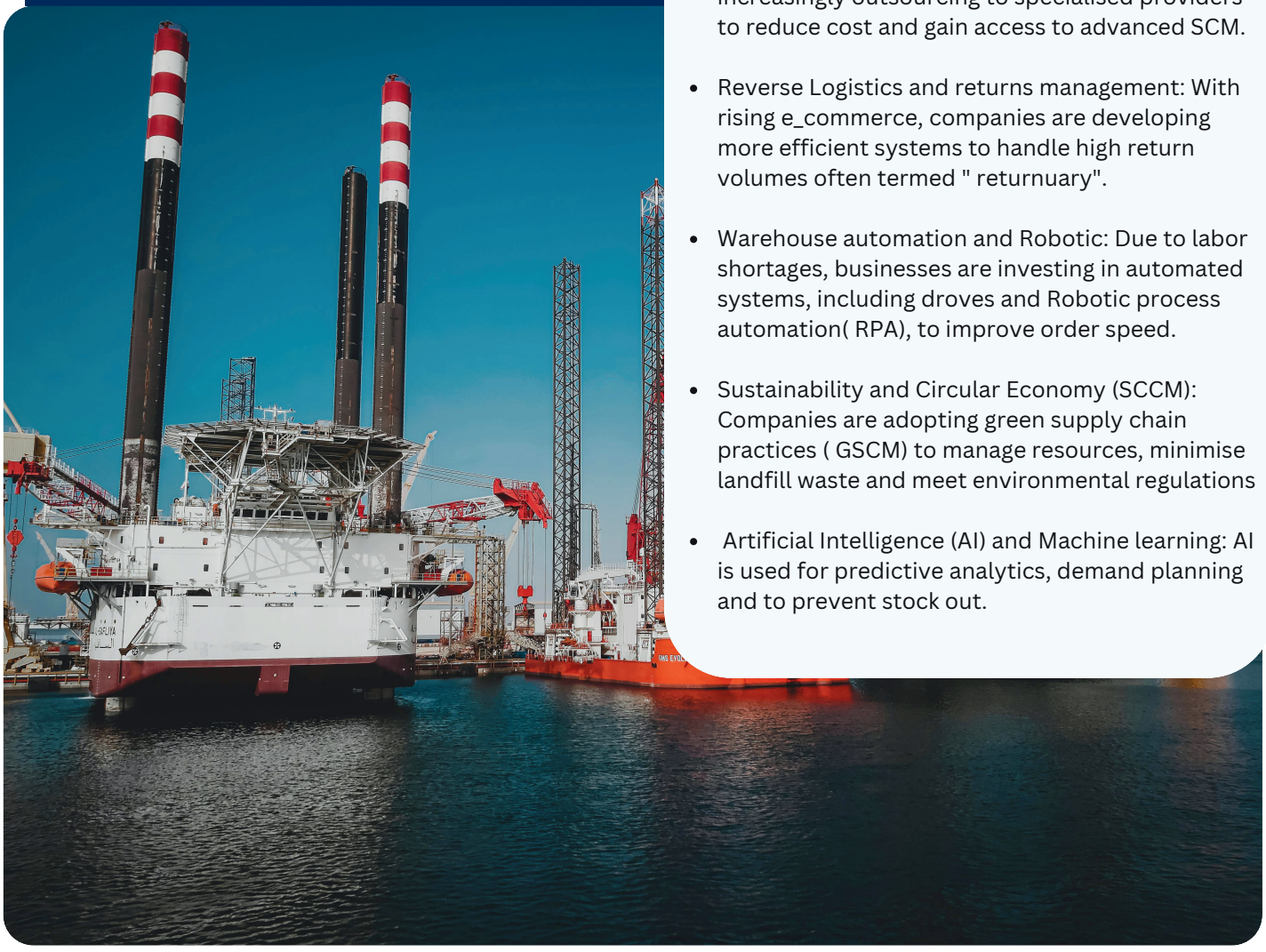

Key Emerging trends in supply chain

- Visibility and Digitalisation: The integration of Internet of things (IOT) and block chain provides real _ time tracking, increasing transparency from supplier to consumers.
- Resilience and Agility: Moving from just in time to " just- in -case " strategies, firms are diversifying suppliers and using digital twins to stimulate disruptions.
- Supply chain as a service (scaas): Companies are increasingly outsourcing to specialised providers to reduce cost and gain access to advanced SCM.
- Reverse Logistics and returns management: With rising e_commerce, companies are developing more efficient systems to handle high return volumes often termed " returnuary".
- Warehouse automation and Robotic: Due to labor shortages, businesses are investing in automated systems, including droves and Robotic process automation(RPA), to improve order speed.
- Sustainability and Circular Economy (SCCM): Companies are adopting green supply chain practices (GSCM) to manage resources, minimise landfill waste and meet environmental regulations
- Artificial Intelligence (AI) and Machine learning: AI is used for predictive analytics, demand planning and to prevent stock out.

Written By: DR. Victor Onunga

COMING UP ON AISCR

May Webinar

This sessionaims to explore how evolving global political dynamics are reshaping supply chain strategies and decision-making. As trade tensions, economic sanctions, and regional rivalries intensify, supply chains are no longer driven solely by cost and efficiency, but increasingly by risk, resilience, and strategic alignment.

This discussion will examine how geopolitical developments influence sourcing decisions, trade flows, regulatory compliance, and market access. It will also provide a platform to understand how organizations can anticipate disruptions, navigate sanctions regimes, and build adaptive supply chain models in an increasingly fragmented global landscape. Scan the QR or use the link:

Three days Executive Leadership Forum; Public Procurement and contract Management-From Compliance to Public Value

The Executive Leadership Forum is hosted by the Advanced Institute for Supply Chain Research (AISCR) in partnership with the University of Buea and the Yaoundé International Business School. The program brings together academic expertise, professional training, and industry perspectives to strengthen procurement leadership and institutional capacity.

Event Address: DJEUGA PALACE

Date: 27-29 May 2026

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Ports, Procurement and People Building the Caribbean's Logistics

The Caribbean is on the brink of a major transformation. With new oil and gas developments, expanding trade corridors, and rising global demand for efficient port systems, the region is entering a high-stakes era of opportunity and competition. But one critical question remains: Is the region's workforce truly ready to deliver? Without the right skills, systems, and supplier capacity, the benefits of this transformation risk being delayed or worse, lost to external players. Register using the QR on the flyer or use the link: https://us02web.zoom.us/meeting/register/H_cdk8vrQiSU3WTI9jBZrg#/registration

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