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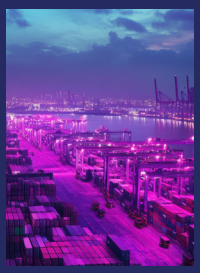

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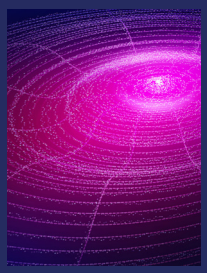

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BUILDING THE CAPABILITY OF PROJECT PROFESSIONALS



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GEOPOLITICS & SUPPLY CHAIN RESILIENCE IN COMPLEX PROJECT DELIVERY

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GEOPOLITICS & SUPPLY CHAIN RESILIENCE IN COMPLEX PROJECT DELIVERY: THE CASE OF THE SEMI-CONDUCTOR INDUSTRY
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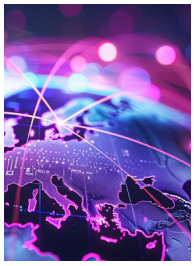

GENERATIVE AI IN MODERNISING LEADING COMPLEX PROJECTS IN THE WORLD OF SUPPLY CHAIN AND GEOPOLITICAL CHALLENGES
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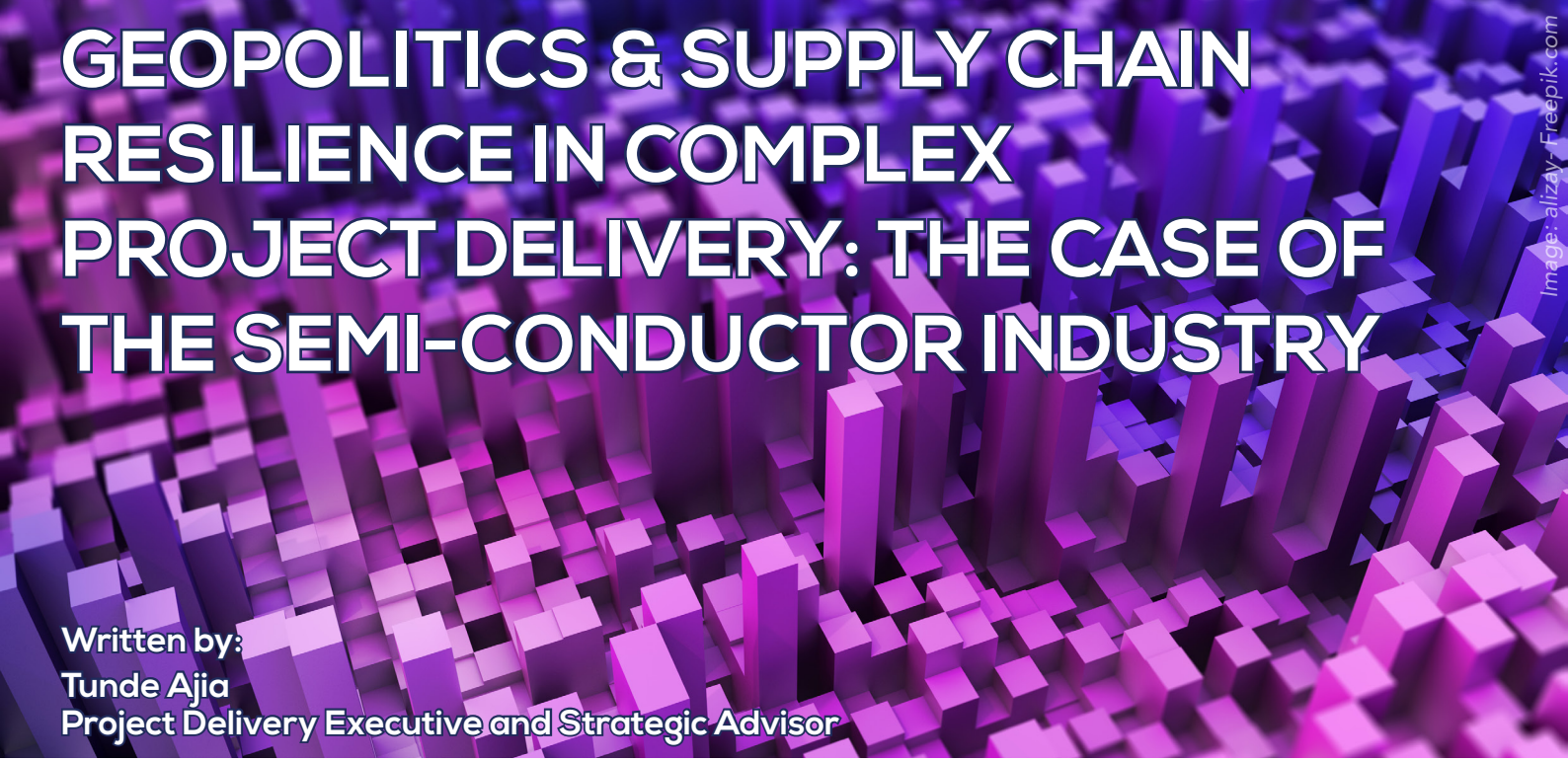
GEOPOLITICS & SUPPLY CHAIN RESILIENCE IN COMPLEX PROJECT DELIVERY: THE CASE OF THE SEMI-CONDUCTOR INDUSTRY



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Introduction

For decades, Complex Project Delivery (CPD) protocols have focussed on optimising cost and speed. This governance policy has made international supply chains to build their logistics around the expectation of a stable, predictable global market. However, this framework has collapsed due to escalating trade wars leading to sudden tariff changes, regional conflicts leading to blockades, and geopolitical and economic decoupling leading to export bans. What once seemed like optimised procurement has devolved into chronic operational friction. Hence, the survival of international supply chains must radically reassess the planning and execution of major capital assets.

This shift presents deep vulnerabilities in high stakes CPD sectors including defence, aerospace, and critical infrastructure. These industries rely on long asset lifecycles, single-source components, and complex global supply chains. The semi-conductor industry illustrates this vulnerability as producing just one advanced microchip depends on fragile geographic monopolies such as the Taiwanese fabrication foundries, and specialised Asian chemical suppliers. A single trade restriction, export control, or maritime conflict can abruptly halt operations freezing billions of dollars in stranded capital. Consequently, CPD resilience must shift from passive risk monitoring to active operational elasticity. Leaders must build systems that are capable of absorbing macroeconomic shocks and prevent catastrophic schedule delays.

Ultimately, legacy risk management frameworks are failing by treating geopolitical volatility as unmanageable external variable. Instead of viewing global instability as a force majeure, leaders must regard it as standard operational system constraints. True geopolitical resilience requires incorporating adaptable strategies from a project's conceptualisation stage. Unlike traditional frameworks that focus on predicting specific events, resilient leaders need to build flexible strategies, diversify supply chains, and use adaptive governance to ensure projects thrive despite sudden political, economic or regulatory changes.

Theoretical Foundations vs. Pragmatic Realities

Academic research highlights how supply chain vulnerability is heavily impacted by its network design, focussing on concepts like network density and structural holes (Bellamy and Basole, 2012; Kim et al., 2014). Structural holes refer to the critical gaps between disconnected groups that can be bridged by a single intermediary, but this creates a single point of failure. If that intermediary suddenly falls within a newly restricted geopolitical border, then the entire supply chain collapses. Conversely, high network density involves tightly interconnected supplier relationships which drive efficiency, but introduces risk through vulnerabilities. Hence, when localised geopolitical shocks spread across the dense networks, the layout backfires causing a damaging contagion effect. Collectively, these architectural vulnerabilities severely amplify the

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geopolitical bullwhip effect. Consequently minor lower-tier policy shifts or export controls (at Tier-3 or Tier-4) ripple upstream to create severe material shortages and major delays at the project site.

Despite sophisticated network models, frontline procurement faces an execution gap, which leads to operational chaos. Operational risk management remains severely limited by outdated registers, zero sub-tier supplier visibility, and mismatched contract goals leaving project teams blind to vulnerabilities beyond Tier-1 or Tier-2 partners. This execution gap is worse during the construction of next-generation semi-conductor fabrication plants. These facilities require billions of dollars in sunk costs, and hyper-synchronised deployment of highly specialised infrastructure. Even with stable Tier-1 contracts, project teams face massive blind spots. They are often completely unaware that an important Tier-4 vendor, that produces niche components such as fluoropolymer-coated stainless exhaust systems or specialised manifold boxes, operates entirely within a politically unstable territory.

Thus, when trade restrictions cut off a Tier-4 vendor's supply of raw materials such as gallium, ultra-pure helium, or semi-conductor grade neon; it triggers cascading delays on the project site. Fixed-price contracts provide no structural protection during these crises, they merely trigger legal disputes while physical construction stalls and critical "Ready for Equipment" (RFE) milestones slip by months or years.

To close this gap, project delivery must evolve from static mitigation into a dynamic capability that includes systematically sensing intelligence; understanding the interplay between national policies, international relations, and industry governance; seizing agile governance; and transforming supply chain networks as technological and geopolitical boundaries shift (Xiong et al., 2024).

Core Insights & Strategic Imperatives

To safeguard semi-conductor fabrication projects, leaders must look beyond their immediate contract partners and establish multi-tier visibility. Primary choke points rarely occur at the Tier-1 construction management level; instead, they are hidden deep within sub-tier supply chain networks where material processing and specialised manufacturing are concentrated in volatile territories.

For instance, a fabrication facilities developer might manage their Tier-1 clean room integrator perfectly, but the critical path is dictated by Tier-3 or Tier-4 sub-vendors handling neon gas, silicon wafers, or rare earth elements. A single border conflict, environmental freeze, or export tariff targeting an upstream raw material supplier instantly chokes the production of custom parts like ultra-high-purity valve manifold boxes or chemical delivery modules. Without continuous, automated mapping to identify these deep-tier dependencies, developers remain perpetually reactive, blindsided by upstream bottlenecks before the missing materials ever arrive at the fabrication site.

Shifting towards national economic resilience is underpinned by huge subsidies as highlighted in the U.S. CHIPS Act which has forced a re-evaluation of long-term sourcing. To build structural buffer capacity, project teams must balance the economic trade-offs of friend-shoring (restricting nodes to allied nations), near-shoring (eliminating border frictions, but with additional costs), and dual-sourcing (qualifying two separate suppliers for the same critical component) for critical-path materials. Consequently, project leaders must utilise value-at-risk simulations to justify these structural cost premiums. Paying regional dual-sourcing premiums is far more effective than absorbing devastating financial penalties, lost market opportunities, and increased overheads of stalled, multi-billion dollar fabrication projects.

Under modern geopolitical environment, traditional, adversarial contracting frameworks collapse under geopolitical economic pressure. This is because rigid fixed-price contracts intended to shift all supply and inflation risks onto contractors, instead trigger contractor defaults, litigations, and abandoned construction sites. To withstand these systemic pressures, semi-conductor fabrication projects must pivot toward collaborative procurement models such as Integrated Project Delivery (IPD) and alliance contracting (Zhang et al., 2018). By consolidating owners, designers, and key trade contractors within a unified, multi-party agreement, IPD creates a genuine shared-risk and

shared-reward model that aligns stakeholders collectively resolve supply chain supply chain failures. However, trust and contract formalisation are imperative ingredients (Zhang et al., 2018).

Under IPD, geopolitical conflicts that disrupt supply chains, leading to schedule slips and cost overruns are absorbed by pre-negotiated, shared contingency fund, preventing partner bankruptcy. Integrating these collaborative models with automated smart contracts ties price adjustments dynamically to real-time, market indices, transforming risk mitigation from a zero-sum dispute into coordinated, team response.

Conclusion

In the modern era of intense de-globalisation, geopolitical literacy has transformed into a core engineering requirement for complex infrastructure project strategic leaders. For the semi-conductor industry, constructing a multi-billion-dollar fabrication plant is no longer restricted to a technical challenge of microscopic clean room tolerances; it has rather evolved into a high-stakes exercise in securing national technological sovereignty. Project leaders who continue to blindly rely on fragile, single source global supply chains, risk trapping their massive capital assets indefinitely. The future belongs to those who design resilience into procurement pipelines, transforming geopolitical foresight into a structural advantage.

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About the Author

Tunde Ajia is a project delivery executive, strategic advisor and project management thought leader who has led complex projects and major programmes across sectors, industries and geographies. His work sits at the intersection of strategy, policy and the delivery of capital-intensive projects, with a particular focus on infrastructure, megaprojects and the organisational capabilities required to deliver them successfully.
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