

# AI Management Innovation in Volatile International Markets

Falayi Olukayode, Tai Solarin University of Education, Ogun State, Nigeria. olukayodefalayi@yahoo.com

The world of today's trade is characterised by the structural volatility of geopolitical decoupling, fragmentation of supply chains, a proliferation of regulations and a very dynamic demand structure. In this environment, the use of artificial intelligence (AI) has become a management lever of first choice that can encompass predictive forecasting, regulatory compliance, supply chain optimisation, financial risk management and much more. This article looks at the impact of AI on real country-level innovation in managers in turbulent global markets using empirical evidence and real country-level data. It presents an AI Management Innovation Framework (AMIF) consisting of six application domains, and evaluates their competitive impact in key markets such as the United States, China, UAE, Singapore, Germany, India, the United Kingdom, and Brazil. Results suggest that higher AI investment and usage levels in countries and firms are measurably correlated with improved adaptation to trade volatility, while a growing AI gap between economies is a systemic risk to inclusive trade growth [3][4].

## The Management Problem: Volatility as the New Baseline

It is no longer the normal state of affairs that international markets find themselves in stable equilibria between

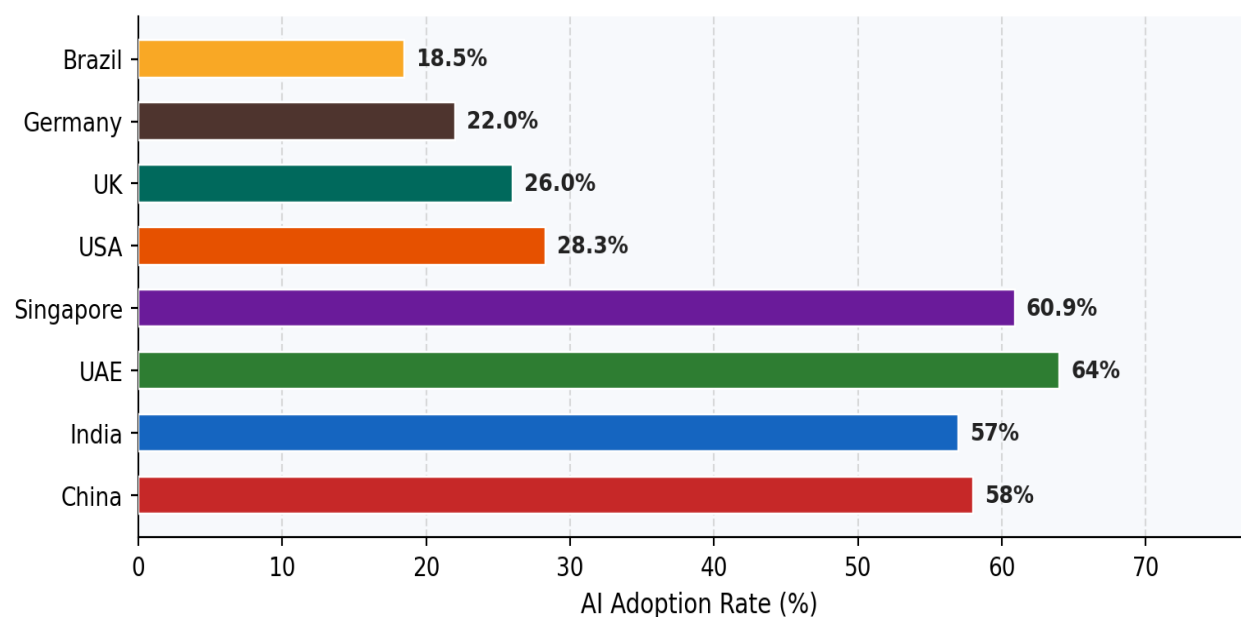
disturbances (volatility is now the state of affairs). Companies involved in global trade have faced an unprecedented series of overlapping shocks since 2020, including a COVID-19 supply shock, the Russia-Ukraine conflict and the commodity shock, the shipping crisis in the Red Sea in 2024, and an escalating trend of industrial policy nationalism in the United States, European Union, China and India. Merchandise trade volume shrank by 1.1% in 2023 – the steepest decline since the global financial crisis in 2008 – and is expected to grow by 2.6% in 2024 [3]. In that context, the typical management solutions that have been tried (cost-cutting, single-source purchasing, and fixed pricing) have proven ineffective in achieving competitive durability. The keyword that remains, and is expressed in (Teece, Pisano and Shuen, 1997): dynamic environments require dynamic capabilities, not static resources, to create sustained competitive advantage: the capacity to sense change, seize opportunities and reconfigure assets. In the international trade context, this ability is nowadays most commonly realised in terms of AI technologies. The management challenge is thus not only about the implementation of AI, but how to do it strategically, that is: when to use which AI applications, in which sequence and within which governance frameworks, while taking account of the fact that adoption rates and

investments in AI are unevenly distributed across countries (see Figure 1 and 2). This article tackles this question by looking at the AMIF and its six application domains, using country-level evidence.

## Country-Level AI Adoption and Investment: A Diverging Landscape

The world is divided into AI leaders and laggards, and the implications for the competitive positioning of markets with headquarters -- or those using headquarters as a base -- are obvious.

**Figure 1. Enterprise AI Adoption Rate by Country, 2024**



*Sources: Stanford AI Index 2025; McKinsey Global Survey 2024; WTO-ICC AI and Trade Survey 2024.*

Figure 1: Enterprise AI adoption rate by country, 2024 (%). sources: stanford AI index 2025; McKinsey global survey 2024; WTO-ICC AI and trade survey 2024

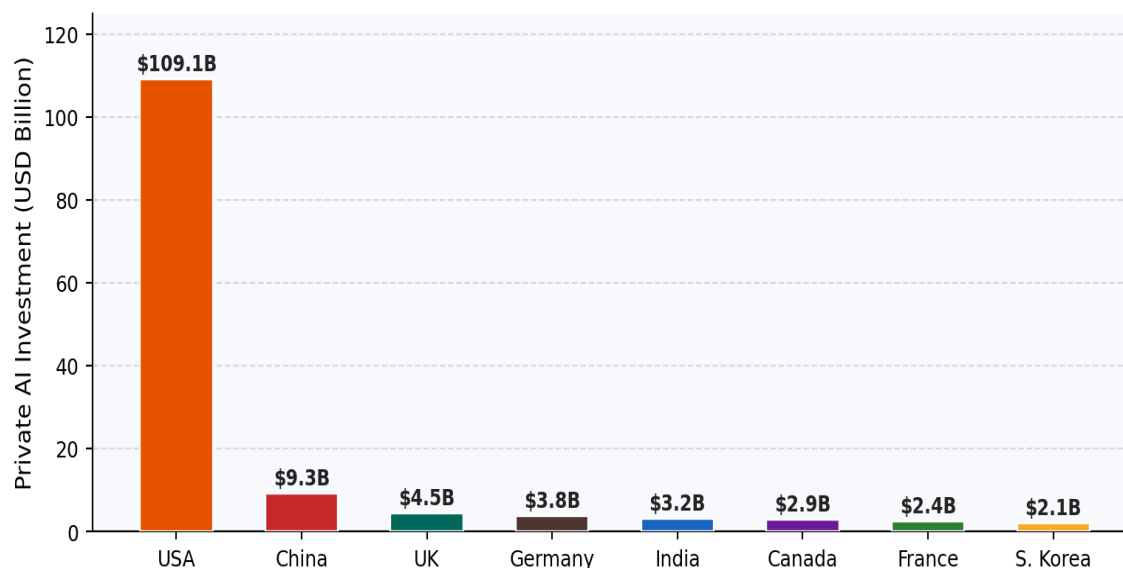
Figure 1 shows UAE (64%) and Singapore (60.9%) are leading in enterprise AI adoption -- a surprising finding, given these are smaller economies, driven by strategic national

initiatives towards AI and technology-savvy regulatory frameworks. Among the big economies, China (58%) had the strongest state-directed momentum, while the momentum of the

private sector was strongest in India (57%). Although the U.S. accounts for a significant proportion of AI investments in the global market, in actual usage in enterprise applications, the adoption rate is relatively low at 28.3%, representing the diversity and fragmentation of the U.S. economy, not a lack of

AI capability [4]. The mid-tier accounts for 44.5% of all adopters, with Germany and Brazil both at 22% and the UK at 26% – but both countries face challenges of regulatory hesitancy, legacy infrastructure, and skills.

**Figure 2. Private AI Investment by Country, 2024 (USD Billion)**



Source: Stanford AI Index 2025 (Stanford HAI). Note: USA investment nearly 12x China's; 24x the UK's.

Figure 2: Private AI investment by country, 2024 (USD Billion). source: stanford AI index 2025 (Stanford HAI).

Note: UAE and singapore data not separately reported at this scale; national fund-level investment is substantial

As shown in figure 2, the world market for AI investment is highly skewed in favor of the Chinese. In 2024, the United States spent USD 109.1 billion on private AI -- about 12 times the amount spent by China (USD 9.3 billion), 24 times the amount spent by the UK (USD 4.5 billion), and nearly 29 times the amount spent by Germany (USD 3.8 billion) [4]. This

investment gap has clear management consequences, as companies in high-investment countries have access to more sophisticated and constantly improving AI solutions, leading to even greater benefits in supply chain optimisation, market intelligence, and regulatory compliance. The best practice for companies in lower investment markets is to leverage AI

solutions via global cloud platforms, partnerships and technology licensing agreements, and not wait for domestic development. According to the WTO, 2024, this is an AI divide: only about 30% of developing economies have taken AI policy measures, with one LDC (Uganda) doing so, based on OECD AI Policy Observatory data. Firms in lower-income markets are at a disadvantage, with only 41% using AI compared to more than 60% of higher income firms. In a scenario directly related to competitiveness in the face of trade volatility, (Bughin et al., 2018) modeled the macroeconomic impact of differential adoption of AI, demonstrating that early adopters may gain around three times the productivity benefits of late adopters.

## The AI Management Innovation Framework (AMIF)

The AMIF is structured around six applications of AI that collectively span the key components of trade volatility. The core of the AI-driven management is the integrated data, model and decision infrastructure, the management core, which lies at the centre and enables all surrounding domains. The core is linked by 6 satellite domains, which are all interdependent and share data flow to and from each other, all of which produce the competitive outcomes represented in table 1. The architecture is shown in figure 3.

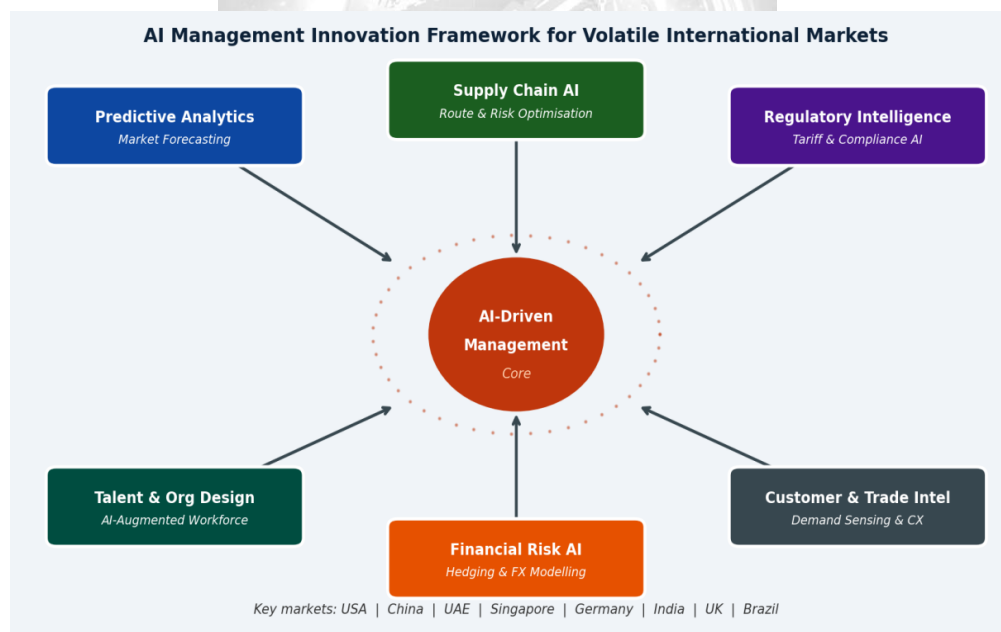


Figure 3: AI management innovation framework (AMIF): six-domain architecture for volatile international markets.

Note: arrows represent data and decision flows between satellite domains and the AI-driven management core

The AMIF is not a sequence, but a concurrent and interdependent system. Customer and Trade Intelligence is providing real-time data to inform Supply Chain AI routing decisions; Regulatory Intelligence is alerting which drives Financial Risk AI hedging adjustments and Predictive Analytics is providing outputs that feed into Talent and Organisational Design planning. The interactions occur at a rapid pace with high accuracy, thanks to the central AI core, which is about large-scale data infrastructure, enterprise AI governance, and machine learning operations (MLOps) platforms. Companies with investments in this core exhibit significantly quicker adaptive responses to trade shocks, including (WTO, 2024; Ivanov & Dolgui, 2020) US technology intensive multinationals, financial services companies from Singapore, logistics companies from UAE, and manufacturing conglomerates from China. The six domains of AI management innovation.

## **Six Domains of AI Management Innovation**

### **Predictive Analytics: From Reactive to Anticipatory Management**

The area where AI capability can be most easily translated into managerial anticipation is predictive analytics, which involves demand forecasting, supplier risk scoring, macro-economic scenario modelling, and more. Prices have been lowered by 15-20% for inventory costs, and supplier risk

models that use geopolitical, financial and logistical data have lowered the rate of procurement disruption substantially for US and European firms using machine learning-based demand forecasting. According to McKinsey Global Institute [1], AI-powered analytics will add USD 1.7 trillion to the value of the supply chain by 2030 alone.

### **Supply Chain AI: Routing, Resilience, and Multi-Sourcing**

AI tools in the supply chain tackle the most immediate facets of trade volatility. The lead times can be shortened by as much as 30% in documented cases with the implementation of AI-based route optimisation tools that dynamically reroute cargo based on port congestion, shipping lane closure and tariff changes, under the leadership of Chinese and Singaporean companies. PSA International in Singapore has heavily invested in AI port management systems that combine customs pre-clearance, berth scheduling and cargo tracking into a single intelligence platform, while COSCO Shipping outfits its China-based ports with systems. Both PSAs and COSCO Shipping have invested in AI port management systems that integrate cargo tracking, berth scheduling and customs pre-clearance into a unified intelligence platform, COSCO equipping ports in China with the systems. According to (Ivanov & Dolgui, 2020), AI-driven supply chain sensing is one of the key viability mechanisms that allows companies to not

just recover from disruption, but also re-structure themselves around it [5].

### **Regulatory Intelligence: Navigating Tariff and Compliance Complexity**

The situation is both complex and burdensome, as the number of trade restrictions has increased from around 1,100 in 2019 to more than 3,200 in 2022 (WTO, 2024). AI based regulatory intelligence platforms, which are widely used by UAE-based logistics companies and Indian IT services exporters, have been able to automate tariff classification, rules-of-origin validation, and utilisation of trade agreements, cutting down compliance costs by approximately 25%. As per WTO (2024), AI can help lower the trade costs of lower-income economies by automating trade paperwork, which can be especially beneficial for markets like India and Brazil with high administrative trade costs compared to OECD countries. A course in financial risk modeling and hedging using AI, including FX and credit.

### **Financial Risk AI: Hedging, FX, and Credit Modelling**

AI-powered financial risk platforms are being implemented by US and German companies that combine the analytics of forecasting foreign exchange values with the modelling of commodity prices and the scoring of credit risk into a single, real-time treasury management system, with early results showing about 18% savings in FX losses. The financial value of AI solutions for financial firms is enormous, with the Stanford

AI Index (2025) estimating that 61% of financial institutions in the U.S. have implemented AI solutions, including an AI fraud detection system by JPMorgan Chase that saves the firm USD 150 million a year.

### **Customer and Trade Intelligence: Demand Sensing at Scale**

In Brazil and South Korea, AI-driven customer intelligence and demand sensing solutions are helping companies to anticipate demand in export markets more quickly than standard market research. Natural language processing models using trading data as well as social media sentiment and point-of-sale data give near real-time insights into demand migration, so commercial teams can respond to product mix, price and channel strategy change within days not quarters [3]. Documented use of AI-based demand sensing has generated revenue uplifts between 8-12% for a variety of industries, including consumer goods and industrial products [1].

### **Talent and Organisational Design: Building AI-Augmented Workforces**

Organisational architectures that enable effective, scalable deployment, governance and learning about AI systems are essential to sustained AI management innovation. India and the UK have become the top two countries in the world to foster AI talent: In the last decade, the number of AI companies in the UK has increased by more than 600%, and the United States and India collectively make up more than half of the global AI

workforce (Stanford HAI, 2025). AI-enhanced workforce design (a combination of AI tools and human oversight and interpretability) is estimated to increase productivity by about 22% (McKinsey Global Survey, 2024; Teece et al., (1997) would describe this as the most basic reconfiguration ability: to continuously sense, absorb and act on the intelligence AI can generate, as a human-organisational system [2].

## Comparative Assessment Across AI Application Domains

Table 1 brings together evidence from the 6 AMIF domains in a structured comparison of application areas, key markets driving the adoption of AI, core functions, outcome evidence in the documentation, and the horizon of implementation and competitive impact.

Table 1: AI management innovation: comparative assessment across six application domains

| AI Application          | Key Markets      | Function                              | Evidence Outcome               | Impact | Horizon |
|-------------------------|------------------|---------------------------------------|--------------------------------|--------|---------|
| Predictive Analytics    | USA, UK, DE      | Supply & demand forecasting           | Reduced inventory costs 15–20% | High   | Short   |
| Supply Chain AI         | China, Singapore | Route & disruption optimisation       | Lead time cut by up to 30%     | High   | Medium  |
| Regulatory Intelligence | UAE, India       | Tariff and compliance automation      | Compliance cost -25%           | Medium | Short   |
| Financial Risk AI       | USA, Germany     | FX hedging & credit risk modelling    | Reduced FX losses 18%          | High   | Short   |
| Customer & Trade Intel  | Brazil, S.Korea  | Demand sensing and CX personalisation | Revenue uplift 8–12%           | Medium | Medium  |
| Talent & Org Design     | India, UK        | AI-augmented workforce planning       | Productivity +22%              | Medium | Long    |

Note. Evidence outcomes are drawn from (Bughin et al., 2018), Stanford HAI (2025), WTO (2024), and McKinsey Global Survey 2024 industry deployments. Impact: High = material competitive differentiation;

Medium = operational improvement. Horizon: Short = 0-12 months; Medium = 1-3 years; Long = 3+ years.

## Managerial Imperatives: From Framework to Action

The AMIF and country-level evidence presented above give rise to three main principles.

**Prioritise the AI core before the satellite domains:** Make sure the AI core is first, not the satellite domains. The six application domains of the AMIF can only be as effective as the data infrastructure that feeds into it, the MLOps capability, and the governance for AI that forms the core. Point AI solutions without a clear data architecture create disjointed intelligence that is not part of the cross-domain feedback loops shown in figure 3. As shown in figure 2, this is a foundational investment that is disproportionately allocated to it: US companies are investing USD 109.1 billion in AI, a large portion of which is being invested in capabilities at the infrastructure level, which in turn are going to create value in domain-specific applications.

**Bridge the AI divide through ecosystem strategy:** Lower-investment-markets firms, like smaller companies in South Korea and in Brazil and India, can't match the AI infrastructure of the US or Chinese conglomerates organically. But they have the option of gaining access to similar capabilities via the strategic deployment of globally available cloud AI platforms (AWS, Azure, Google Cloud), via AI tool licenses and participation in national AI infrastructure programmes. While acknowledging that AI can prove beneficial for lower-income

economies in lowering trade costs, the (WTO, 2024) notes that this benefit is not necessarily given by itself, but must be actively sought.

## Conclusion

AI-based innovation in management is not merely a supplementary benefit to a company's or nation's approach to international trade anymore; it is essential for sustaining long-term competitiveness in an unpredictable market environment. As evidenced by the findings of this article, companies and nations that have been pursuing the development of AI-based management competencies possess significantly higher levels of adaptability, which can be seen in their faster recovery periods, reduced compliance expenditures, optimized financial risk hedging, and enhanced business responsiveness. The AMIF framework offers a set of principles for building these competencies through six interdependent pillars built around a strong AI-based management core.

In terms of the country-specific data, there is one conclusion that can be made with certainty: investments lead to adoption, which leads to success. In light of the US having invested USD 109.1 billion into private sector AI technologies in 2024, China being involved in its semiconductor and AI fund investments initiatives, and Singapore and the UAE being at the early stages of implementing their national AI programs, it is safe to say that AI-based innovation in management is no longer marginal, but

rather the foundation of competitive infrastructure in trade markets.

## References

1. Bughin, J., Seong, J., Manyika, J., Chui, M., & Joshi, R. (2018). Notes from the AI frontier: Modeling the impact of AI on the world economy. *McKinsey Global Institute*, 4(1), 2-61.
2. Teece, D. J., Pisano, G., & Shuen, A. (1997). Dynamic capabilities and strategic management. *Strategic management journal*, 18(7), 509-533. [https://doi.org/10.1002/\(SICI\)1097-0266\(199708\)18:7%3C509::AID-SMJ882%3E3.0.CO;2-Z](https://doi.org/10.1002/(SICI)1097-0266(199708)18:7%3C509::AID-SMJ882%3E3.0.CO;2-Z)
3. World Trade Organization. (2024). *Trading with intelligence: How AI shapes and is shaped by international trade*. WTO Secretariat.
4. Stanford University Human-Centered Artificial Intelligence. (2025). *Artificial Intelligence Index Report 2025*. Stanford HAI. Stanford, CA.
5. Ivanov, D., & Dolgui, A. (2020). Viability of intertwined supply networks: extending the supply chain resilience angles towards survivability. A position paper motivated by COVID-19 outbreak. *International journal of production research*, 58(10), 2904-2915. <https://doi.org/10.1080/00207543.2020.1750727>

