

## THE EVOLUTION OF SMART INVENTORY MANAGEMENT: INTEGRATING AI, IoT and LLMs INTO DYNAMIC CAPABILITIES

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### Abstract

*This paper evaluates how inventory-management technologies have developed over the last decade (2014-2024) and records the transformation of the traditional ERP-focused models to complex cognitive ecosystems. It aims at establishing the technological synergies and also solving the Emerging Market Paradox, wherein infrastructure shortages hinder the adoption of Industry 4.0 in countries like Nigeria. A Systematic Literature Review (SLR) was performed based on PRISMA 2020. Using thematic synthesis, 57 high-quality peer-reviewed articles and authoritative market reports were synthesized in order to map the technological pathways and barriers to adoption. The findings show that there is a four-step evolutionary migration, (1) Foundational Integration, (2) Real-time Visibility through IoT, (3) Predictive AIAnalytics and (4) The Cognitive Frontier (LLMs and Digital Twins). Although AI and LLMs are transformative in offering Actionable Insights, a major SME Barrier exists in emerging markets because capital intensity is high, there is a deficit in infrastructure, and cognitively skilled labor is scarce. The paper presents the Integrated Smart Inventory Ecosystem (ISIE) model that operationalizes the Resource-Based View (RBV) to integrate separate technologies into a Dynamic Capability. This framework is an implementation roadmap that is staged and highly modular, and which is specifically designed to fit into resource-constrained environments, thus closing the gap between a high-level theory and emerging market realities.*

**Keywords:** Industry 4.0, Smart Inventory Management, ERP, IoT, Artificial Intelligence (AI), Large Language Models (LLMs), Resource-Based View (RBV), Emerging Markets.