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Reimagining Item Setup and Maintenance with Generative AI in Large-Scale Retail Ecosystems

Abdul Gafoor Palakkal Abdul Khader

Senior Engineering Lead, World's Largest Retailer

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Abstract:

Item setup and maintenance represent one of the most complex and error-prone processes in large-scale retail ecosystems, particularly in global marketplaces involving millions of stock keeping units (SKUs), diverse product types, and region-specific compliance requirements. Traditional rule-based systems and manual workflows struggle to scale, resulting in data inconsistencies, delayed time-to-market, and reduced content quality.

This paper presents an enterprise-grade application of Generative Artificial Intelligence (GenAI) to automate and optimize supplier-facing item setup and maintenance workflows. The proposed GenAI-driven system dynamically generates, validates, and enriches item attributes based on product type, regulatory context, and historical data. By introducing AI-assisted attribute generation with human-in-the-loop verification, the approach significantly improves content accuracy, reduces downstream data errors, and accelerates item readiness for omnichannel retail.

The findings demonstrate that GenAI can serve not merely as an automation tool, but as a self-improving intelligence layer that enhances data quality, operational efficiency, and supplier experience across global retail platforms.

Keywords: Generative AI, Retail Technology, Item Setup, Product Content Quality, Supplier Platforms, Enterprise AI

1. Introduction

Global retailers operate at unprecedented scale, managing millions of items across physical stores and digital marketplaces. Each item must be accurately defined through a complex set of attributes, including product specifications, regulatory constraints, logistics metadata, and localization rules. These attributes vary significantly by product type such as apparel, electronics, or consumables and are further constrained by regional compliance, taxation, and safety regulations.

Supplier-facing item setup systems traditionally rely on static templates, validation rules, and manual data entry. While effective at smaller scale, these approaches introduce friction as product complexity grows. Suppliers often encounter repeated data errors, leading to rework, delayed onboarding, and inconsistent customer-facing content.

Recent advances in Generative AI provide an opportunity to reimagine this process. Instead of requiring suppliers to manually interpret attribute requirements, GenAI can infer, generate, and validate item data intelligently. This paper explores how GenAI was integrated into a large-scale retail item setup platform to improve content quality, reduce errors, and accelerate item lifecycle readiness.

2. Background and Problem Statement

2.1 Complexity of Item Attribute Management

Each retail item may require hundreds of attributes, categorized as:

- **Required attributes** (mandatory for listing and compliance)
- **Optional attributes** (enhancing discoverability and content richness)
- **Conditional attributes** (dependent on product type, category, or geography)

For example, apparel items require fabric composition and sizing standards, while electronics demand voltage ratings and certification details. Additionally, location-specific regulations introduce further constraints, making item setup a cognitively demanding task for suppliers.

2.2 Limitations of Traditional Systems

Traditional item setup platforms suffer from:

- High dependency on supplier expertise
- Rule-based validations that fail to capture semantic intent
- Reactive error handling rather than proactive guidance
- Poor scalability as attribute models evolves

These limitations result in data errors propagating downstream into pricing, inventory, compliance, and fulfillment systems.

3. GenAI-Enhanced Item Setup Approach

To address these challenges, a GenAI-driven enhancement was introduced into the supplier-facing item setup application. The system leverages large language models fine-tuned on product taxonomies, historical item data, compliance rules, and domain-specific knowledge.

Key Capabilities:

- Automated attribute inference based on product description and metadata
- Context-aware validation aligned with regional and category rules
- Intelligent suggestions for optional attributes to improve content quality
- Human-in-the-loop review for accountability and trust

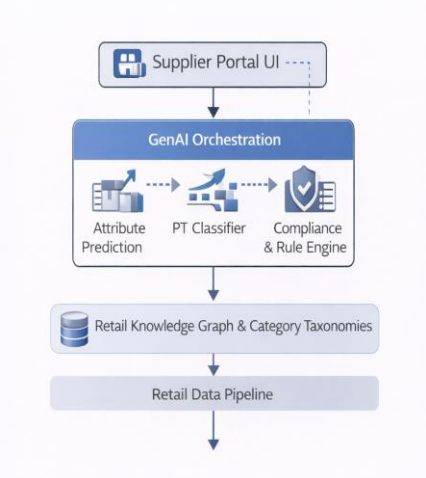

Figure 1 – GenAI-Enhanced Item Setup Overview

4. Comparative Workflow Analysis

4.1 Traditional Workflow

In legacy systems, suppliers manually populate attributes, encounter validation errors, correct them, and resubmit. This iterative process often leads to frustration and delays.

4.2 AI-Enabled Workflow

With GenAI, the system pre-populates attributes, flags ambiguities, and provides explainable suggestions. Suppliers shift from data entry to data validation, significantly reducing cognitive load.

Figure 2 – Traditional vs AI-Enabled Item Setup Workflow

5. GenAI-Driven Item Data Architecture

The underlying architecture integrates GenAI as a core intelligence layer rather than an external add-on. The system consumes multiple data sources, including product catalogs, regulatory databases, supplier history, and customer behavior signals.

Key architectural components include:

- Prompt orchestration and domain grounding
- Attribute confidence scoring
- Feedback loops for continuous learning
- Integration with downstream retail systems

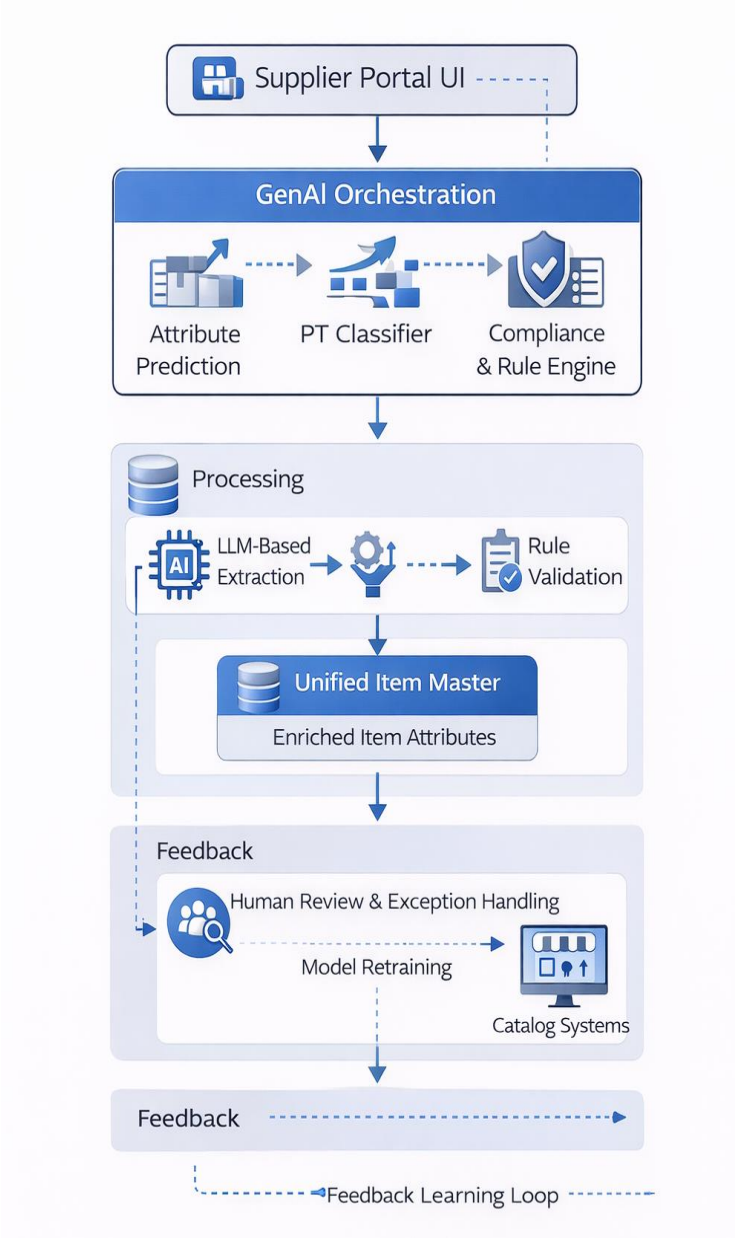

Figure 3 – GenAI-Driven Item Data Architecture

6. Self-Learning and Continuous Improvement

A defining feature of the system is its self-learning capability. Supplier edits, error corrections, and approval outcomes are fed back into the model training pipeline. Over time, the GenAI system improves its accuracy, reduces false positives, and adapts to evolving product standards. This creates a virtuous cycle where every item setup interaction enhances future performance.

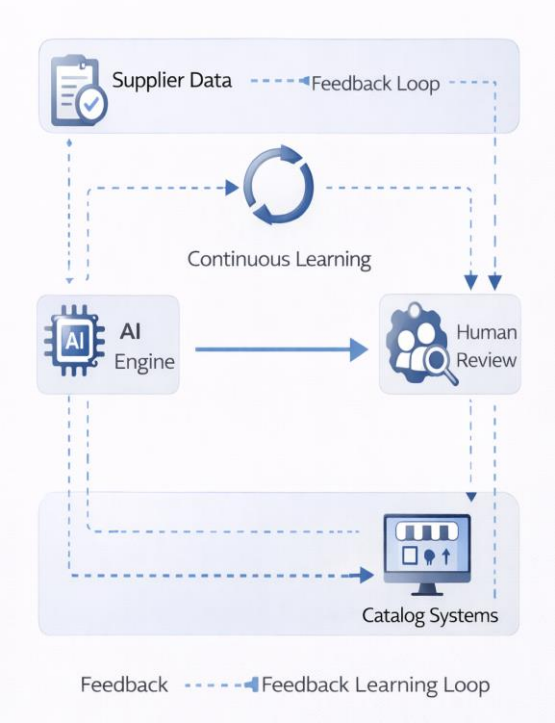

Figure 4 – Self-Learning GenAI Item Ecosystem

7. Business Impact and Outcomes

The GenAI-enhanced system delivered measurable enterprise benefits:

- Significant reduction in item setup errors
- Faster time-to-market for new items
- Improved consistency in customer-facing content
- Reduced operational overhead for suppliers and internal teams

More importantly, the system established a scalable foundation for intelligent automation across the retail value chain.

8. Originality and Contribution

This work demonstrates a novel application of Generative AI in supplier-facing retail systems, moving beyond experimentation into production-scale impact. Unlike generic AI-assisted content tools, the presented approach embeds GenAI deeply into enterprise workflows, compliance logic, and feedback-driven learning loops.

The methodology and architecture described in this paper contribute original insights into how GenAI can be responsibly operationalized in complex, regulated environments.

9. Author Contribution Statement

The author led the conceptualization, system design, and implementation of the GenAI-enhanced item setup platform. Responsibilities included defining the AI integration strategy, overseeing architectural decisions, evaluating system performance, and documenting outcomes. This work reflects original contributions derived from real-world enterprise deployment.

10. Conclusion

Generative AI has the potential to fundamentally transform how retail items are onboarded and maintained at scale. By shifting from rule-based validation to intelligence-driven assistance, retailers can improve data quality, accelerate operations, and enhance supplier experience.

This paper demonstrates that when thoughtfully integrated, GenAI becomes not just a productivity tool, but a strategic capability for modern retail ecosystems.

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