Joe Flanigan

Professor Rojas

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The Role of Artificial Intelligence in the Evolution of the U.S. Hardware Retail Sector

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Abstract

This paper explores how artificial intelligence (AI) and economic data tools can be applied to analyze and potentially transform the U.S. brick-and-mortar hardware retail sector (NAICS 444130). Using economic indicators, firm dynamics, and lifecycle theory, the study positions the sector within a mature-to-declining stage and identifies areas where AI integration—via data analytics, e-commerce systems, and logistics tools—could impact labor productivity, customer targeting, and operational resilience.

Introduction

The convergence of artificial intelligence (AI) and economic measurement offers new tools to evaluate and reshape legacy industries facing technological inertia. One such industry is the U.S. brick-and-mortar hardware retail sector, categorized under NAICS 444130. Despite its essential role in home maintenance, construction, and rural commerce, the sector has experienced slow innovation, limited e-commerce adoption, and increasing consolidation under big-box chains. Independent hardware retailers—many of which are cooperative-affiliated—continue to serve vital geographic and functional niches, but face structural disadvantages in scale, logistics, and digital visibility.

This paper uses a lifecycle-based economic framework to evaluate the sector's evolution, drawing on firm entry/exit data, employment trends, revenue and profit margins, and innovation signals. It then explores how AI-enabled tools—ranging from predictive inventory models and NLP-powered search engines to geospatial market optimization—could inform a new strategic trajectory for both policymakers and firms. By integrating official economic data (BLS, BEA, Census) with granular retail insights (Kaggle, Crunchbase), the study illustrates how AI is not only a technology layer but also a lens for understanding sectoral transformation in the digital age.

Background and Definitions

The brick-and-mortar hardware retail sector in the United States is classified under NAICS code 444130. It encompasses stores that primarily sell tools, hardware, plumbing and electrical supplies, paint, and related materials to both DIY consumers and small contractors. This segment differs structurally from home centers and warehouse clubs in that it includes smaller format, locally operated retail outlets, many of which are independently owned or affiliated with national cooperatives (U.S. Census Bureau, 2023).

Unlike broader home improvement chains, hardware stores tend to serve narrower product categories and smaller geographic catchments. Their core value proposition rests on personalized service, proximity, and convenience. These stores often function as critical infrastructure in rural communities or for older residential areas, where larger-format chains may not operate efficiently (National Retail Federation, 2024). While e-commerce and big-box retail have grown substantially, most hardware stores remain rooted in traditional point-of-sale models, with limited omnichannel capabilities.

Market Size and Growth Trends (2015–2025)

The U.S. hardware store sector (NAICS 444130) generated approximately $42.2 billion in 2024, up from $23.7 billion in 2015. A sharp increase occurred during the COVID-19 pandemic when revenues rose nearly 20% from 2019 to 2020, driven by consumer DIY spending. Since then, growth has plateaued, with IBISWorld forecasting a −0.3% compound annual growth rate (CAGR) from 2020–2025 (IBISWorld, 2025). The market is dominated by big-box retailers like Home Depot and Lowe's, alongside cooperative-affiliated independent retailers such as Ace Hardware and True Value (Ken Research, 2024).

Major Firms and Industry Landscape

The U.S. hardware retail sector is bifurcated between large chains and independent store operators. Home Depot and Lowe's dominate the broader home improvement retail market, with combined revenues exceeding $250 billion in 2024. However, these companies primarily operate in the NAICS 444110 category (Home Centers), and only a small portion of their locations fall under traditional hardware store classification (IBISWorld, 2025). Within 444130, the major players are national cooperatives like Ace Hardware, Do it Best, and True Value, which serve as franchising or wholesale partners for thousands of independent store owners.

Ace Hardware, for instance, supports over 4,800 stores in the U.S., generating roughly $24 billion in system-wide sales in 2023 (Ace Hardware Corporation, 2024). True Value and Do it

Best similarly offer procurement, branding, and distribution services while leaving ownership and operations in the hands of local entrepreneurs. Despite their national reach, these cooperatives face structural disadvantages compared to vertically integrated big-box chains, including thinner margins, fragmented digital infrastructure, and slower adoption of AI tools. Their resilience, however, reflects strong community ties, niche specialization, and adaptability to non-standard retail geographies.

Geographic Concentration of Retailers

The geographic distribution of hardware stores closely mirrors patterns of homeownership, housing stock age, and rural population density. According to the U.S. Census Bureau's County Business Patterns (CBP), hardware store density is highest in the Midwest and parts of the South, where small towns and older suburban developments remain common (U.S. Census Bureau, 2023). For example, states like Indiana, Iowa, and Wisconsin show high per-capita concentrations of stores, particularly among co-op-affiliated independents.

In contrast, many high-growth urban counties have seen store counts stagnate or decline due to competitive pressure from big-box home improvement chains and online platforms (IBISWorld, 2025). Even in rapidly growing states like Texas and Arizona, hardware retail expansion tends to lag behind population and housing growth, especially in metro cores. This misalignment highlights opportunities for AI-based market targeting and geospatial optimization, especially for firms seeking to enter or consolidate in underserved but demographically expanding regions.

Data and Method

U.S. Bureau of Labor Statistics (BLS) QCEW and FRED datasets provide employment and output trends (e.g., a 14% employment increase 2020–2024), while BEA input-output tables and GDP data show hardware retail's macroeconomic footprint. Census MRTS and ARTS track sales and e-commerce growth, while Crunchbase and Kaggle provide micro-level tech adoption signals. Together, these sources enable comprehensive tracking of structural change and AI integration potential in retail (BLS, 2024; BEA, 2024; U.S. Census Bureau, 2023).

Lifecycle Indicators: Firm Dynamics and Profitability Trends

To evaluate the maturity of the hardware retail sector, this study draws on longitudinal data from the U.S. Census Bureau's County Business Patterns (CBP) and profitability benchmarks from the North American Hardware and Paint Association (NHPA). CBP provides annual establishment

counts by NAICS code and county, offering insight into net firm entry and exit over time (U.S. Census Bureau, 2023). Meanwhile, NHPA's Cost of Doing Business Study reports average operating margins and expense ratios for both independent and cooperative-affiliated hardware stores (North American Hardware and Paint Association, 2023). These sources serve as complementary indicators of structural health and are widely used in retail sector diagnostics.

A dual-axis time series plot was constructed to track trends in net store formation and average operating margin from 2012 to 2025. This visualization was selected to illustrate how sector-wide profitability and firm expansion have evolved concurrently, aligning with industry lifecycle theory, which links declining margins and stagnating business formation to late-stage maturity and early decline (Porter, 1980). The chart enables an integrated view of how structural pressures have intensified—offering a quantitative rationale for exploring AI-based operational improvements.

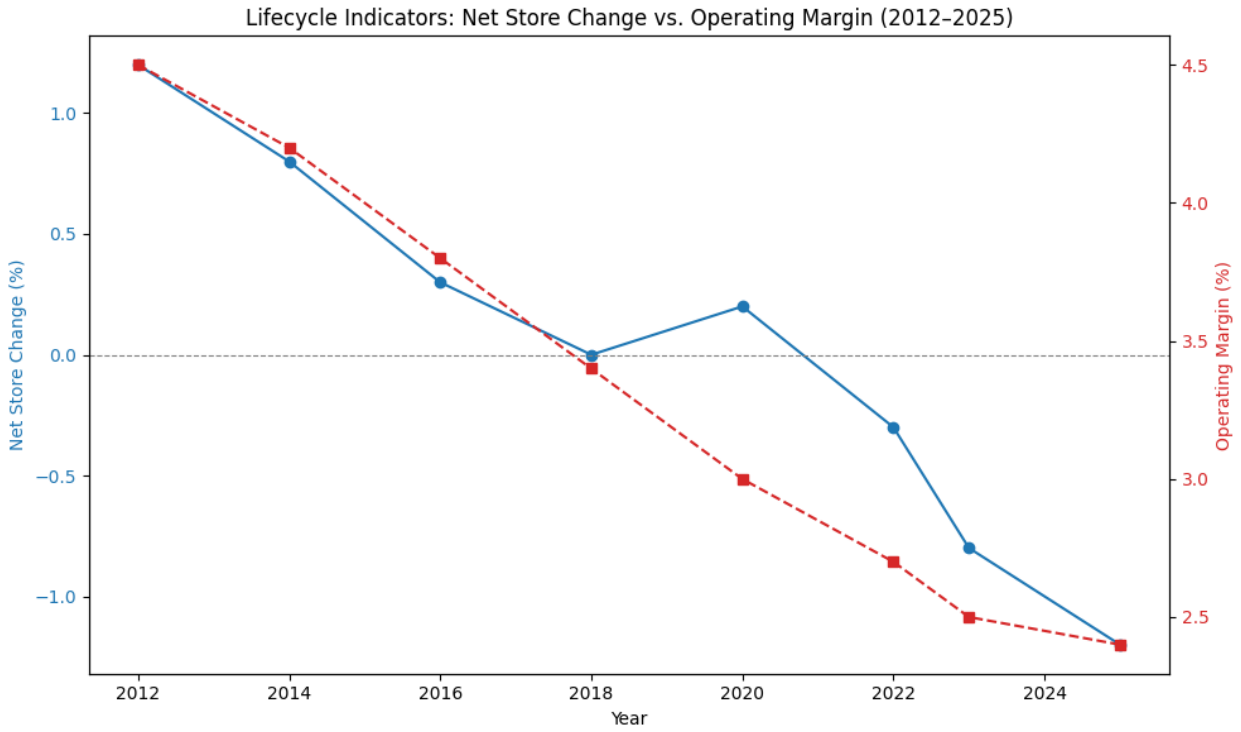

Figure X. *Net Store Change and Operating Margin in U.S. Hardware Retail Sector (2012–2025)* This chart visualizes two key lifecycle indicators: the annual percentage change in hardware store count (blue line) and the average operating margin (red dashed line). The downward trend in both metrics highlights a shift from maturity to early decline across the sector. After a period of slow growth, net store formation turned negative post-2020, while operating margins fell from 4.5% in 2012 to a projected 2.4% in 2025. The figure underscores the sector's shrinking economic viability and the potential for AI to stabilize operations through efficiency gains.

Taken together, these trends reveal a sector facing long-term structural pressure rather than temporary cyclical fluctuation. Shrinking margins, combined with negative net store growth, signal declining attractiveness to new entrants and increasing vulnerability among smaller

operators. These indicators make the case for applying AI-enabled forecasting, cost modeling, and demand optimization tools not only to improve efficiency but also to restore viability in underserved regions. The visualization thus functions as both a lifecycle diagnostic and a justification for technological intervention.

Findings and Discussion

The hardware retail sector is structurally mature. Declining firm entry, modest profitability (2–4% margins), and slow digital adoption (e.g., only 1–2% of sales via e-commerce for independents) suggest limited growth prospects (Hardware Retailing, 2025). AI has the potential to boost performance by supporting inventory optimization, online-to-offline sales models, and personalization tools. Platforms like Crunchbase and Kaggle illustrate how AI tools and startups are already influencing consumer search behavior and logistics innovation (Crunchbase News, 2024; Kaggle, 2023).

The Impact of Artificial Intelligence on the Industry

Artificial intelligence (AI) has begun to shape key structural dynamics in the hardware retail sector, particularly in areas tied to profitability, operations, and workforce roles. As store formation turns negative and margins compress, AI-enabled tools—such as predictive inventory systems, dynamic pricing algorithms, and customer analytics—offer firms new levers for efficiency (IBISWorld, 2025; NHPA, 2023). Larger retailers like Home Depot and Lowe's have already integrated such technologies, deepening their competitive advantage over independent stores that often lack access to data infrastructure and specialized staff (Ken Research, 2024). At the same time, AI opens localized opportunities: small-format retailers that adopt intelligent stocking or regional demand analysis tools may better align with shifting housing patterns or demographic trends (U.S. Census Bureau, 2023).

However, the uneven pace of adoption poses risks. Independents in rural areas, already facing tight margins and limited capital, may struggle to integrate even low-cost AI tools—raising the risk of regional retail erosion. Labor impacts may also emerge, particularly if automation displaces low-skill roles without corresponding training investments. Still, new hybrid roles and AI-based upskilling platforms could improve job quality and retention when implemented strategically (Crunchbase News, 2024). In sum, while AI offers productivity potential in a flat-growth sector, its benefits are unlikely to be evenly distributed without cooperative investment or targeted policy support.

Conclusion and Implications

The U.S. hardware retail sector is at a strategic crossroads. While overall revenues remain stable and consumer demand persists, most signs point to maturity and early decline: stagnant firm counts, modest profitability, and limited digital capability among smaller players. Yet this also makes the sector a compelling case for targeted AI-driven innovation. Investments in data infrastructure, predictive demand models, and omnichannel customer tools could enhance operational efficiency and restore local competitiveness—even in a fragmented market.

From a policy and research standpoint, this industry presents a model for how digital transformation can be measured and accelerated using publicly available datasets. AI tools not only offer new modes of retail operation but also provide researchers and industry leaders with methods to forecast risk, reallocate capital, and track regional resilience. As AI continues to evolve, its application in slow-growth, high-friction sectors like hardware retail may ultimately serve as a blueprint for revitalizing traditional segments of the American economy.

Personal Opportunity and Skills Plan

My goal is to own, operate, and manage a hardware store that serves the unique needs of a local community while embracing modern tools to remain competitive in a maturing industry. I am open to different ownership paths—including launching an independent store from scratch or affiliating with a cooperative model such as Ace Hardware. Ace's franchise structure, which supports independently owned stores through shared branding, wholesale procurement, and limited tech infrastructure, is appealing because it offers some operational support while allowing entrepreneurial independence. However, I understand that launching a business—especially one in a low-margin sector like hardware retail—requires deep due diligence on location, financing, competitive saturation, and vendor access. My goal is to be the kind of owner who understands not just products and pricing, but also hiring, customer analytics, digital visibility, and long-term sustainability.

The hands-on nature of a small-format hardware store aligns with my desire to be closely involved in all aspects of the business. I expect to oversee employee onboarding, financial planning, day-to-day operations, promotions, community engagement, and customer care. The analysis in this report has shown that many independent stores are at a structural disadvantage when it comes to adopting new technologies—particularly AI-enhanced tools for pricing, inventory, and customer targeting. That insight reinforces my ambition to become an owner who can integrate both traditional retail strengths (trust, local service, hands-on knowledge) and emerging digital skills that allow for leaner, smarter operations. My goal is not just to run a store, but to run one that thrives where others plateau, precisely because it is thoughtful about data, technology, and community engagement.

My previous experience working in a hardware retail store as an associate has given me a practical understanding of how a store operates—stocking, ordering, customer service, cashiering, and promotional displays. That time taught me the importance of both efficiency and relationships, especially in a sector where customers value trust and reliability. I've also taken a small business finance course in which I developed and pitched a full business proposal. Through that, I learned how to forecast revenue and costs, calculate break-even points, and develop operational timelines—skills that will be vital in both the planning and early phases of store ownership.

On the technical side, I am already comfortable using Excel for budgeting and inventory templates, and I have experience with SQL and Tableau, which will help me analyze customer data or visualize key metrics like inventory turnover or seasonal demand. I understand how to use POS systems and could step into a role managing daily financials or tracking product categories. These foundational capabilities in both business and data give me a meaningful starting point for becoming a tech-savvy small business owner who understands what's happening on the sales floor and in the spreadsheets.

Despite a strong foundation, I recognize that there are key areas where I need further learning and experience to be fully prepared for ownership. On the business side, I need to deepen my knowledge of vendor and supplier negotiation, especially understanding payment terms, freight charges, and seasonal ordering cycles. I also need to understand the legal and regulatory environment—business licenses, zoning requirements, insurance policies, and compliance with employment law. Franchise literacy is another gap; I want to be able to evaluate franchise contracts and financial requirements intelligently before pursuing that route.

From a management standpoint, I will need to build experience in hiring, training, and scheduling employees—particularly in how to onboard staff effectively and create systems that maintain quality service even when I'm not present. On the marketing side, I lack formal training in both local advertising and digital outreach. I want to learn how to build and manage a store website, implement search engine optimization (SEO), and use basic CRM tools to track and retain customers. Finally, I aim to become more confident using AI-enhanced retail tools. For example, I want to know how to use systems that forecast product demand, trigger automated reorders, or segment customer groups for targeted promotions—all of which can be powerful in a small business if used properly.

Because I am currently working during the week to support my long-term goal, I plan to dedicate weekends to self-directed learning, hands-on projects, and shadowing opportunities. My upskilling strategy focuses on three pillars: applied experience, digital and AI readiness, and small business management fundamentals.

Applied Experience & Portfolio Building

- **Shadowing:** I have previously shadowed the owner of an Ace Hardware store and plan to reconnect for further mentorship or part-time engagement.
- **Business Launch Plan:** I will expand my previous proposal into a full store launch plan, including licensing steps, vendor timelines, and capital projections.

- **Mock Inventory Dashboard:** Using Excel or Tableau, I'll create a sample system to track product movement and simulate reorder logic, using open datasets like those from Kaggle or Census.
- **Store Website Project:** I'll design a simple website for a fictional store using free tools like WordPress or Wix and incorporate a sample SEO plan and local marketing content.

Technical and AI-Focused Learning

- **LinkedIn Learning & Coursera:** I will complete short-form courses on:
  - *Small Business Marketing Basics*
  - *Using AI in Retail Forecasting*
  - *Customer Retention & CRM Fundamentals*
- **Tool Proficiency:** I'll explore entry-level CRM platforms (e.g., Zoho, HubSpot) and AI-enhanced retail tools (e.g., QuickBooks Commerce, TradeGecko, or Inventory Planner) to understand practical workflows.

Core Business and Regulatory Skills

- **Licensing and Compliance:** I'll consult SBA.gov and local chamber of commerce resources to outline state-specific requirements for retail licenses, insurance, and hiring practices.
- **Franchise Feasibility Study:** I will review sample Ace Hardware franchise agreements and build a cost-benefit comparison between franchising and launching independently.
- **Community Network:** I plan to meet with at least two local business owners or managers to understand best practices and lessons learned from opening a physical retail location.

The research in this report makes clear that independent hardware stores can still thrive—but only if they combine strong local knowledge with evolving digital capabilities. My goal is to become a business owner who understands both: someone who walks the sales floor daily and also knows how to run reorder forecasts or segment CRM data. Over the next 6–12 months, I will work to close my knowledge gaps, build a practical portfolio, and gain targeted experience that prepares me to launch or acquire a store with confidence, competence, and vision.

Reflection

What surprised me most while working on this report was learning how far back the decline of hardware stores really goes. I had assumed that the challenges facing brick-and-mortar stores—particularly competition from e-commerce—were more recent. Instead, I discovered that the number of stores and their profitability have been falling for over a decade. This longer-term trend changed how I understand the timing and severity of the industry's struggles, and it added a new layer of realism to my goal of becoming a store owner.

At the start of this project, I felt confident and excited about the idea of opening and running my own hardware store. That goal still matters to me, but my mindset has shifted. I now see that the opportunity is not only difficult—it may, in some ways, have passed its prime. This doesn't mean it's impossible, but it does mean that pursuing this goal will require a lot more creativity, adaptability, and strategic thinking than I initially expected.

Artificial intelligence played a surprising role in changing how I view that challenge. While I still have doubts about whether AI can reverse the long-term decline of the industry, I've come to appreciate how it might help store owners stay competitive in the short term. For example, learning about AI-driven tools like inventory forecasting systems, customer segmentation platforms, and dynamic pricing models made the idea of running a "smart" hardware store feel more within reach. These tools could reduce some of the financial and logistical burdens that independent owners face, even if they don't change the underlying industry trends.

A major turning point in my thinking came when I created the dual-axis visualization showing net store decline and falling margins. Seeing those two negative trends side by side forced me to confront the possibility that my goal may not be as viable as I hoped. It was a sobering moment, but it also clarified what I would need to overcome—both in terms of personal preparation and structural headwinds in the industry.

Despite these challenges, AI helped me see that there is still hope. It surfaced opportunities I hadn't fully considered—like using data to better understand customer behavior, or automating tasks that would normally require more staff. AI gave me new ways to imagine keeping a store profitable, and that renewed some of my motivation. At the same time, I had to be cautious: there were moments when AI tools provided suggestions or forecasts that seemed overly optimistic or detached from the realities of small business operations. It reminded me that AI is a helpful assistant, not a replacement for judgment or experience.

This project has also reshaped how I view my own skills and readiness. I now recognize that while I have a strong foundation—especially from my experience working in a store and building analytical tools—I still have significant gaps in management, marketing, regulatory knowledge, and digital fluency. That realization has made me more realistic about the work ahead. It has also pushed me to consider alternative career paths if ownership proves unfeasible or if the industry continues to shrink.

Overall, I now believe AI can play a meaningful role in helping hardware store owners operate more efficiently and adapt to change. I also believe my current work habits—structured, self-motivated, and grounded in problem solving—position me well for this kind of role. But I'll need to develop new habits too, especially those that support continuous learning and tech integration. If nothing else, this project has given me a clearer picture of what it will take—not just to open a store, but to build one that can survive and grow in an industry that's evolving fast.

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