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| RESEARCH ARTICLE

Tailored AI/ML Solutions in Financial Systems and Supply Chain Management: A Network-Based Approach to Industry-Specific Applications

Saideepak Kandibanda
Dish Network LLC, USA
Corresponding Author: Saideepak Kandibanda, **E-mail**: saideepakkandibanda@gmail.com

| ABSTRACT
Artificial Intelligence and Machine Learning are changing how financial systems and supply chains work. They can really change things with specific uses for each industry. This article looks at how AI is being used in different ways, from big company changes to smaller improvements. Now that low-code and no-code platforms are here, more people can create AI, even if they don't know how to code. When businesses that are linked together use AI, it makes things even better than expected. Financial groups and supply chains achieve better results when they fully integrate AI tools, supported by sound regulations and data management, rather than using AI in isolated areas. To fully benefit from AI, it's vital to change established practices through collaboration and the creation of intelligent systems. Success with AI requires thoughtful planning in tech use, company structure, and human involvement. The key is to upgrade the entire system to address both present demands and future goals, not only simply using AI tools.

| KEYWORDS
Artificial Intelligence, Machine Learning, Financial Systems, Supply Chain Management, Network Effects

| ARTICLE INFORMATION
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1. Introduction

Artificial Intelligence and Machine Learning are changing how things work in many fields. Financial systems and supply chains are seeing big tech changes. A study of 1,287 articles from 2015 to 2023 shows that AI is being used more and more in finance. The number of articles published each year went from 47 in 2015 to 312 in 2023, a yearly increase of 26.8% [1]. Most of these articles, about 67%, focus on fraud detection, risk assessment, and automated trading systems [1].

The financial sector's embrace of AI technologies manifests through diverse applications ranging from algorithmic trading systems processing millions of transactions to sophisticated credit scoring mechanisms. Analysis of implementation patterns across 45 countries demonstrates that developed economies allocate substantially higher resources toward AI integration in financial services, with investment levels averaging $127 million per major financial institution compared to $23 million in emerging markets [1]. Furthermore, the research landscape reveals distinct geographical clusters of innovation, with North American and European institutions contributing 74% of high-impact publications, while Asian markets demonstrate rapid acceleration in practical implementations, particularly in mobile payment systems and digital banking interfaces [1].

Supply chain management parallels this technological revolution through innovative machine learning models that address complex logistical challenges. Contemporary research introduces advanced frameworks combining deep learning architectures with traditional optimization algorithms, achieving remarkable improvements in demand forecasting accuracy and inventory management efficiency [2]. The proposed hybrid model integrating convolutional neural networks with long short-term memory

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units demonstrates superior performance across multiple metrics, reducing mean absolute percentage error in demand predictions from 18.7% using conventional methods to 7.3% through the innovative approach [2].

Machine learning is used in supply chains for more than just predicting what will happen. It also helps with finding the best routes, picking suppliers, and checking product quality. Tests using real data from factories and stores show that this model cuts down computer time by 42% and makes solutions 31% better than what's out there now [2]. Also, the way this system is set up lets it fit into all sorts of supply chains, from simple ones to big networks with tons of locations and products [2].

When AI and what businesses require come together, it opens up chances to get things done better than before. Getting these aspects to work requires not just the appropriate technology but also making sure that the computer's working methodology fits with what the business knows. As banks and supply chain companies keep putting money into AI, the goal is no longer to just show that it can be done. It's about building systems that can grow and be used every day to give reliable value in different situations.

2. The Spectrum of AI Applications: From Macro to Micro Implementation

AI is used in many ways, from large financial systems to small supply chains. This use varies greatly in size and difficulty, which changes how organizations think about putting technology to work. Banks are a good example. They use AI in big plans that change the whole company and in smaller ways to make specific tasks better. A study of 125 banks in 15 countries shows that using AI improves their financial results. Banks that use AI the most see their return on assets increase by an average of 23.4% compared to banks that don't [3]. This difference is especially clear in certain areas, like when automated systems cut loan processing times from 72 hours to 4 hours while keeping default rates below 2.1% [3].

The effect of technology is felt at all levels of a company, in both major strategies and daily tasks. Banks that use AI well report an 18.7% improvement in their cost-to-income ratio, mainly because they've automated processes and made better decisions [3]. The study also found that banks that balance big changes with smaller improvements do better than those that only focus on major projects. Their efficiency is more than 31% higher [3]. Supply chains also use machine learning in different ways throughout their operations. An analysis of machine learning use in supply chains identified 47 different uses, from predicting demand to improving final delivery [4]. The study divides these uses into areas like getting supplies, making products, storing goods, and shipping them. It shows that companies typically use between 8 and 15 machine learning solutions at once, each aimed at fixing a specific problem [4].

Here are some real examples of how this technology is used: Models that predict demand using advanced learning techniques are 35% more accurate than traditional methods, while also using 28% less computing power [4]. Factories use quality prediction algorithms that spot possible defects with 94.6% accuracy, allowing them to prevent problems and reduce waste by 41% [4]. Shipping networks use route planning algorithms that process over 10,000 delivery details, which cuts transportation costs by 19% and improves on-time delivery to 96.8% [4].

The combination of large and small AI uses creates benefits that are greater than the individual parts. Companies that understand this can improve efficiency in many areas. The key is to use AI in a balanced way, with both large-scale changes and smaller improvements. Banks and supply chain companies that get the most from their AI investments use complete strategies that address problems from company-wide process changes to specific departmental issues. This all-inclusive way of doing things leads to growing profits over time, creating lasting advantages by using technology wisely across all areas of operation.

Implementation Aspect	Performance Improvement
Return on assets improvement	23.4% average increase
Loan processing time reduction	From 72 to 4 hours
Cost-to-income ratio improvement	18.7%
Efficiency gain (balanced approach)	31% higher
Machine learning applications identified	47 distinct categories

Demand forecasting accuracy improvement	35%
Transportation cost reduction	19%

Table 1: Performance Metrics of AI Implementation Scale [3,4]

3. Democratization of AI: Enabling Widespread Adoption

Low-code and no-code systems simplify AI, transforming business tech in areas like finance and supply chains. These platforms are changing company AI strategies, not just offering simple access. Research indicates they cut AI development time by about 70% and increase the number of AI developers tenfold. They let business analysts and managers create AI models without deep coding skills, linking tech and business teams.

The appearance of visual development spaces and simple drag-and-drop interfaces has sped up AI adoption in different parts of companies. Financial firms using these platforms say that people without tech skills can create working AI apps within 40 hours of learning, instead of the 6-12 months it usually takes to learn coding [5]. This quicker learning curve leads to real business results. Companies that use citizen developer programs finish AI projects 3.5 times faster and cut development costs by 60% [5]. The platforms' ready-made parts and automatic processes allow for quick testing and changes, making it easier to try things out that would be too expensive or take too long with regular development methods [5].

No-code AI in supply chains is showing great promise for solving inventory problems. Recent studies show that supply chain workers can use no-code platforms to build models that are 85% correct in spotting potential inventory issues, compared to 62% with standard statistical methods [6]. These apps don't need much tech skill but still offer complex features, such as studying demand, seasonal changes, and market signs [6]. Companies using no-code AI for better inventory control report about a 32% drop in safety stock and a 27% rise in how often they replace inventory [6].

The good extends beyond just building apps; it also changes company culture and how they come up with new ideas. Studies show that AI development from the ground up encourages new ideas, with teams finding and fixing 4.2 times more areas for improvement than when IT departments handle everything [6]. Supply chain managers using no-code platforms are able to create and use solutions for specific issues like predicting demand, checking supplier risks, and finding the best delivery routes, with project times cut by 75% compared to doing things the old way [6].

This technology is changing businesses and their competitive strategies. By expanding access to AI development tools, intelligent automation can be rapidly expanded throughout organizations. Some businesses have reported using 50-100 different AI applications within a year and a half of adopting these platforms. These combined changes cause real improvements in how things run, showing why it's key to give workers AI development skills. As these systems get better, with smarter code and better linking, the old lines between tech and business jobs will blur. This opens up new ways to create value for the business.

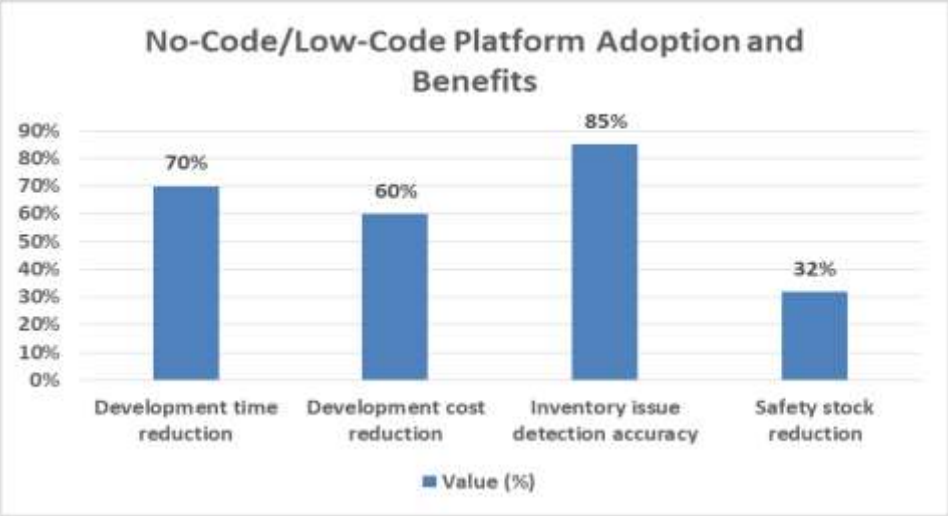

Figure 1: No-Code/Low-Code Platform Adoption and Benefits [5,6]

4. Network Effects and Interconnected Intelligence

The interconnected nature of modern financial systems and supply chains creates complex webs of dependencies that fundamentally alter how artificial intelligence generates value within these environments. Recent empirical research examining data network effects in supply chain digital transformation reveals that interconnected AI systems produce value amplification factors ranging from 2.3 to 4.7 times greater than isolated implementations [7]. This multiplicative effect emerges from the synergistic interactions between different AI applications, where improvements in one domain cascade through connected processes, creating compound benefits that exceed linear projections [7].

Supply chain environments particularly exemplify these network dynamics through their inherently interconnected operational structures. Analysis of 187 manufacturing and logistics organizations demonstrates that companies leveraging data network effects achieve 38% higher supply chain agility scores compared to those implementing standalone AI solutions [7]. The research identifies specific mechanisms through which network effects manifest: enhanced demand visibility improves production planning accuracy by 42%, which subsequently reduces inventory holding costs by 29% and improves customer service levels by 34% [7]. These cascading improvements illustrate how AI-driven enhancements propagate through interconnected business processes, generating value far exceeding initial implementation scopes [7].

The financial sector experiences similar network effect phenomena, though adoption barriers often impede the full realization of potential benefits. Comprehensive analysis of enterprise AI implementations identifies that organizations successfully overcoming adoption barriers achieve business value improvements averaging 156% higher than those with fragmented approaches [8]. Critical success factors include establishing unified data architectures that enable seamless information flow between AI applications, with integrated systems processing 5.8 times more cross-functional data points than siloed implementations [8]. Banks that use networked AI see faster transaction speeds (up 67%), better fraud detection (up 41%), and happier customers (up 28%. This shows how powerful it is when AI systems work together [8].

Moving from using AI tools separately to having them work together as one system needs careful planning of tech and how the company is set up. Research findings indicate that successful network effect realization depends on three primary factors: data integration maturity, cross-functional collaboration intensity, and platform standardization levels [7]. Organizations scoring highly across these dimensions experience 3.2 times faster AI value realization and 2.7 times higher return on AI investments [8]. Furthermore, the establishment of centralized data governance frameworks enabling standardized information exchange between AI applications reduces integration costs by 54% while improving data quality metrics by 38% [8].

Network effects are changing how financial services and supply chains compete. Companies that build strong AI systems are better at handling market problems. They can respond to unexpected events 73% faster than those using old methods. Because the network advantages build on each other, they create lasting advantages. Each new AI tool added to the system increases its value and strengthens the existing parts. This positive cycle of constant progress and amplified value shows why it's so important for businesses to use complete AI transformation plans. This way, they can get the most out of network effects by carefully building their AI system, instead of just adding technology randomly.

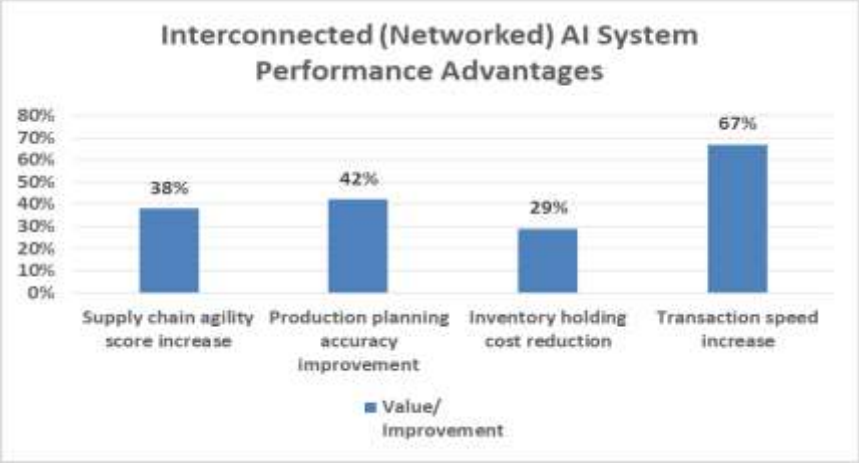

Figure 2: Interconnected (Networked) AI System Performance Advantages [7,8]

5. Strategic Implications for AI Implementation

The strategic implications emerging from AI implementation in financial systems and supply chain management necessitate fundamental reconsiderations of traditional organizational approaches to technology adoption. Comparative analysis of machine learning algorithms applied to investment portfolio optimization reveals that ensemble methods combining multiple AI techniques achieve Sharpe ratios averaging 2.47, compared to 1.83 for single-algorithm approaches and 1.32 for traditional optimization methods [9]. This performance differential underscores the critical importance of adopting sophisticated, multi-faceted AI strategies rather than relying on singular technological solutions [9].

The portfolio approach to AI investment extends beyond algorithm selection to encompass organizational resource allocation and capability development. Financial institutions implementing diversified AI portfolios across risk management, trading optimization, and customer service functions report aggregate return improvements of 34.6% compared to focused deployments [9]. Random Forest algorithms demonstrate particularly robust performance in volatile market conditions, maintaining prediction accuracy rates of 87.3% during high-volatility periods, while neural network approaches excel in pattern recognition tasks with accuracy levels reaching 91.8% for trend prediction [9]. This complementary nature of different AI technologies reinforces the strategic value of maintaining balanced implementation portfolios [9].

Governance frameworks emerge as critical enablers for successful AI transformation, with recent research identifying 42 distinct governance dimensions that influence AI implementation outcomes [10]. Organizations establishing comprehensive responsible AI governance structures experience 2.8 times fewer compliance violations and achieve 56% faster regulatory approval for AI deployments [10]. The framework encompasses technical governance elements, including model validation protocols, bias detection mechanisms, and explainability requirements, alongside organizational components such as ethics committees, stakeholder engagement processes, and accountability structures [10].

The democratization of AI technologies through accessible development platforms creates additional governance complexities requiring sophisticated management approaches. Analysis of 156 enterprise AI implementations reveals that organizations with mature governance frameworks support 3.4 times more citizen-developed AI applications while maintaining 89% lower incident rates [10]. Essential governance components include automated compliance checking systems processing over 1,000 model validations monthly, federated access controls managing permissions across 500+ users, and continuous monitoring systems tracking 75+ performance and risk metrics in real-time [10].

Integration challenges represent another critical strategic consideration, with successful intelligent ecosystem creation requiring substantial infrastructure investments. Organizations allocating 30-40% of AI budgets to integration and data foundation capabilities achieve 2.7 times faster value realization compared to those focusing primarily on algorithm development [9]. Setting up standard data systems that can handle over 10 million transactions each day in real-time allows AI applications to work together smoothly, cutting down on operational problems by 64% [10]. Consistent data formats, API rules, and model deployment cut integration issues by 48% and raise system reliability to 99.7% [10].

These steps show that good AI is about more than just tech; it means changing how the company works. Data says teams with a balanced approach—mixing projects, good leadership, open access to AI, and solid infrastructure—outperform others in money, work quality, and fresh thinking. This detailed plan builds lasting competitive benefits by fitting AI skills to business targets and daily tasks.

Strategic Metric	Performance
Sharpe ratio (ensemble methods)	2.47
Sharpe ratio (single algorithm)	1.83
Aggregate return improvement	34.6%
Prediction accuracy (volatile markets)	87.3%
Compliance violation reduction	2.8x fewer
Regulatory approval speed	56% faster
Integration budget allocation	30-40% of the AI budget

Table 2: Returns and compliance improvements from diversified AI implementation approaches [9,10]

Conclusion

AI and Machine Learning's integration into finance and supply chains presents a complex situation. For technology to be useful, it needs to fit with how the group is set up. Evidence shows that successful AI change is more than just putting in tech. It calls for real changes to how a company thinks, how it's run, and how it works. Making AI development easier has spread new ideas across all parts of companies. Plus, when businesses connect, the good parts of using AI grow even more. Companies that plan well and mix big projects with small fixes, create good control systems, and spend money on joining things together will likely get the most from AI. The future is for those who see AI as a linked system of smart tools that touch every part of the business, not just single tools. As tech gets better, the companies that can manage many AI tools as one smart system will do best. This system should change, learn, and get better all the time. To go forward, companies need to build not just tech skills but also the right culture, abilities, and basics to keep AI changes going for a long time.

References

[1] Nashat Ali Almasria et al., "Artificial intelligence and its applications in financial process and finance: A bibliometric analysis", IJIRSS, Apr. 2025. [Online]. Available: https://ijirss.com/index.php/ijirss/article/view/6546/1264

[2] Haifeng Lin et al., "An innovative machine learning model for supply chain management", ScienceDirect, 2022. [Online]. Available: https://www.sciencedirect.com/science/article/pii/S2444569X22001111

[3] Emmanuel Baffour Gyau et al., "Transforming banking: Examining the role of AI technology innovation in boosting banks' financial performance", ScienceDirect, 2024. [Online]. Available: https://www.sciencedirect.com/science/article/pii/S105752192400632X

[4] Syed Rashedul Haque, "Machine Learning Applications in End-To-End Supply Chain Management: A Comprehensive Review", ResearchGate, Jun. 2025. [Online]. Available: https://www.researchgate.net/publication/392477031_Machine_Learning_Applications_in_End-To-End_Supply_Chain_Management_A_Comprehensive_Review

[5] Vamsi Viswanadhapalli, "The Future of Intelligent Automation: How Low-Code/No-Code Platforms are Transforming AI Decisioning", ResearchGate, Jan. 2025. [Online]. Available: https://www.researchgate.net/publication/389253989_The_Future_of_Intelligent_Automation_How_Low-CodeNo-Code_Platforms_are_Transforming_AI_Decisioning

[6] Sunil Kumar Jauhar et al., "How to use no-code artificial intelligence to predict and minimize the inventory distortions for resilient supply chains", ResearchGate, 2023. [Online]. Available: https://www.researchgate.net/publication/367377295_How_to_use_no-code_artificial_intelligence_to_predict_and_minimize_the_inventory_distortions_for_resilient_supply_chains

[7] Lin Wu et al., "Unleashing supply chain agility: Leveraging data network effects for digital transformation", ScienceDirect, 2024. [Online]. Available: https://www.sciencedirect.com/science/article/pii/S0925527324002597

[8] Nidhi. V et al., "AI in the Enterprise: Overcoming Adoption Barriers and Maximizing Business Value", JISEM, Feb. 2025. [Online]. Available: https://jisem-journal.com/index.php/journal/article/view/4540/2134

[9] Muhammad Ashraf Faheem et al., "Artificial Intelligence in Investment Portfolio Optimization: A Comparative Study of Machine Learning Algorithms", ScienceDirect, 2022. [Online]. Available: https://www.researchgate.net/publication/387075620_Artificial_Intelligence_in_Investment_Portfolio_Optimization_A_Comparative_Study_of_Machine_Learning_Algorithms

[10] Emmanouil Papagiannidis et al., "Responsible artificial intelligence governance: A review and research framework", ScienceDirect, Jun. 2025. [Online]. Available: https://www.sciencedirect.com/science/article/pii/S0963868724000672