

Impact of Artificial Intelligence Adoption in Supply Chain Management on the Profitability of Quick-Commerce Companies

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Abstract—Quick-commerce companies worldwide have basically leaned into artificial intelligence (AI) in ways that are pretty standard now, like predicting demand, polishing delivery-route decisions, and managing dark-store stock, and they often pitch this as a thing that pushes both operational output and financial returns. In this report, we look at whether when AI is adopted across supply chain routines it lines up with higher net profit margins at quick-commerce firms. We use audited and real financial evidence from 44 companies spread across India, the United States, China, the Middle East, Europe, Latin America, and Australia. The data is pulled only from exchange filings, government company registries, and official annual reports.

We built a multiple linear regression setup, where net profit margin was tested against AI adoption status, firm size (revenue in log form), and year-over-year revenue growth. After diagnostic checks flagged two extreme statistical outliers, we ran the adjusted version of the model ($n=42$). This corrected model, explains about 23.6% of the movement in profit margin ($R^2 = 0.236$, $F = 3.92$, $p = 0.016$), so yes, it's not trivial but it's also not a full story.

The results show no statistically meaningful link between AI adoption and profit margin ($p = 0.320$). In contrast, company size comes up as the only statistically significant factor ($p = 0.009$). What looked like a negative association between revenue growth and margin at first, turned out to be more about those outlier companies than some authentic sector-level trend. So overall, the takeaway is that if AI delivers financial upside, it may not show up clearly in consolidated profitability across this particular set of quick-commerce firms. And scale-related effects, it seems, matter more in quick-commerce earnings than AI adoption status by itself.

Index Terms—Artificial Intelligence, Supply Chain Management, Quick Commerce, Profitability, Regression Analysis, Net Profit Margin, Dark Stores, Demand Forecasting, E-Commerce Logistics, Business Model Dummy Variable.

I. INTRODUCTION

Artificial Intelligence, or AI, is slowly turning into a big deal in modern Supply Chain Management (SCM) these days, like really. Supply chains include a lot of moving parts: purchasing, inventory management, production, transportation, warehousing, and delivery, all of that. Keeping these parts running in a smooth way is getting hard, mainly because firms have to face a mix of issues, changing customer demand, massive streams of data, supply disruptions, climbing costs, plus fiercer competition.

AI can help companies sort through it all by using information to notice patterns, produce forecasts and also assist with decision-making. Take it this way, AI is used for demand forecasting, inventory control, choosing suppliers, route planning, warehouse operations, and even risk prediction. Machine learning can review older sales records to estimate upcoming demand, and AI-based systems can help teams spot likely disruptions across the supply network, then react sooner rather than later.

When organizations adopt AI, there are a number of advantages. Forecasting can get more accurate, excess inventory can drop, operating costs can go down, delivery performance can improve, and decisions can happen faster. On top of that, AI strengthens supply chain resilience, because it can help organizations detect the unexpected disruptions quicker and respond with more structure.

Adopting AI is kind of not always easy, and organizations can run into a few problems, like high price tags for implementation, missing skilled employees, data that is not that great, cybersecurity risks and at the same time privacy worries, plus problems when AI needs to connect with the existing

systems. For small and medium sized companies, it can be even more difficult, simply because they tend to have tighter budgets and fewer technological tools. So, looking into AI in supply chain management really matters, because it helps explain both the upside and the tricky parts of putting it in place. This study looks at how AI is currently being used across supply chains, what it does to operational results, and which adoption challenges show up for organizations when they try to move forward with AI. It also points out chances for further AI applications, aiming to support supply chains that become more efficient, more robust, and more sustainable over time.

II. LITRE REVIEW

1. Toorajipour et al. (2021)

Toorajipour et al. studied how Artificial Intelligence (AI) gets used in supply chain management. In their view, AI can support demand prediction, inventory control, transportation, and the whole decision-making cycle. Since AI can process huge volumes of data, managers may be able to act more quickly with fewer delays. Still, they also said that stronger, more practical research is required, to clarify how organizations actually roll out AI, and how they then assess the real gains.

2. Pournader et al. (2021)

Pournader et al. looked at multiple uses of AI across supply chains. Their findings suggest AI tends to raise operational efficiency, along with improving forecasting, purchasing, logistics and inventory choices. But the way many papers are done is kind of isolated, like each AI use-case is examined alone, not as one connected system. So, more study is needed to see how AI works when applied end-to-end across the full supply chain.

3. Riahi et al. (2021)

Riahi et al. analyzed how research topics on AI in supply chains are developing over time. They reported that work is growing on machine learning, data analytics, optimization, and automation. Those tools can help firms refine their day-to-day operational decisions. Yet, the paper leaned mostly on what already exists in the literature, so additional research based on real company data is required, to grasp the true effect of AI.

4. Culot et al. (2024)

Culot et al. concentrated on empirical evidence about AI in supply chain management. They noticed AI being adopted more and more for forecasting, planning, logistics, and broader supply chain decision support. At the same time, they pointed out several obstacles, like not enough knowledgeable staff, issues with low-quality data, substantial setup and implementation costs, and the tricky part of fitting AI into legacy systems.

5. AI and supply chain risk management

Research about AI and supply chain risk management suggests that AI can help companies spot trouble sooner, anticipate likely disruptions, and respond faster when operational problems start to appear. In real deployment, AI might digest information tied to suppliers, shipping pathways, and also those changing market conditions, to surface risks that otherwise stay hidden at first glance. Still, there is a need for more inquiry, to verify if AI can actually manage disruptions in real settings, not only in controlled experiments where everything looks tidy and kind of predictable.

6. AI for supply chain resilience

Studies on AI and supply chain resilience point out that AI can assist organizations prepare for disruptions, react while they are happening, and recover after the fact. AI may reinforce early warning systems, and it can steer decision makers toward more solid actions when strange events show up. Yet more research is needed, to clarify which AI approaches work best for different disruption types, because every disruption behaves differently, and doesn't unfold in the same way.

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8. AI in closed-loop supply chains

Work on closed-loop supply chains indicates that AI can be useful for returns, recycling, remanufacturing, and other broader recovery activities. AI can help firms decide what should happen with returned items, meaning if they are resold, refurbished, or sent into a different recovery track. But compared with older, more straightforward supply chain duties, the AI research focused on recycling and reverse logistics is still limited, and in some areas it feels somewhat underdone.

9. AI in sustainable supply chains

Research on AI and sustainable supply chains reports that AI can help firms handle supply chain information, and in turn improve environmental performance. AI can support more sensible resource use, and it may help identify where waste can be cut back. Even so, key concerns—such as data quality, data sharing, privacy

10. Deep learning and machine learning in SCM

From the research side, deep learning and machine learning seem to work for demand forecasting, inventory control, supplier selection, production planning, and also transportation. In general, they can pick up patterns inside huge datasets and then spit out predictions that are somewhat helpful. That said, firms often run into problems around data availability, needing technical know-how, and the implementation costs, which can be a real burden.

11. AI and ML for supply chain recovery

Studies about AI and machine learning specifically for supply chain recovery suggest that these tools can help companies react to disruptions, and then restore operations faster. AI has the ability to analyze a few recovery alternatives and back managers when choosing what action to take. Yet, it looks like we still need more studies in real-life environments; to truly see how much AI improves recovery performance, not just on paper.

12. Machine learning applications in supply chain management

Research on machine learning applications indicates that ML is already used in inventory management, demand forecasting, supplier management, risk management, and supply chain collaboration. In

practice, these uses can enhance both prediction quality and decision-making. But still, more work is needed to clarify if these benefits actually become measurable, meaning cost reductions and better operational results, in a consistent way.

13. Generative AI in supply chain management

More recent research has started to look at Generative AI and large language models within supply chain management. GenAI can support planning, procurement, communication, information analysis, and decision-making. Still, since this area is fairly new, there's a need for further evidence on accuracy, reliability, data privacy, security, and the level of managerial trust, so companies feel comfortable using it.

14. AI Research Trends in Supply Chain Management

Research on AI trends in supply chain management seems to be getting tightly linked with Industry 4.0, digital transformation, automation, and also sustainability. It kind of signals that AI is turning into a core ingredient in day-to-day operations. Still, a lot of the existing work leans more toward describing research directions rather than what companies actually roll out. So there is a clear need for more empirical studies, with evidence that comes from real implementations instead of only theoretical models.

15. Analytical Review of AI Applications in SCM

When you look at analytical reviews, AI can assist many supply chain tasks, forecasting, inventory handling, logistics operations, procurement, and even decision-making. In general, AI improves the speed and the decision quality when reliable data is available. But organizations can run into problems like heavy investment costs, not enough employees who are trained, data quality issues that are not small, and the usual headache of integrating AI with existing systems that are already in place.

16. AI in Reverse Logistics

Studies related to AI in reverse logistics suggest that AI can enhance product returns and support better recycling, repair, reuse, and recovery processes. For instance, AI can be used to estimate how many items will come back, and also to figure out the best processing route. Even so, this field is still growing, and more research that uses actual company data is

needed, because much of what exists so far feels early-stage and not fully tested in practice.

III. PROBLEM STAMENT

Quick-commerce firms are starting to use AI in parts of their supply setup. A few teams use it to forecast demand. Others look at it for stock planning and replenishment. Some tools also help with picking orders, choosing routes, and the daily check-ins staff must do.

People who back this trend name a few wins. They say workflows may feel smoother. They also expect day to day costs to drop. Another aim is less wild swings in inventory. When customer demand changes, or when supplier delays happen, AI may let a firm respond sooner.

Even so, the move is not an easy plug-in. Setting things up can take real money. Hiring and training can be hard, so some firms fall short on staff. Company data may be missing details, and cleaning it up can take time. There are also privacy and hacking concerns that need careful work. And new software does not always fit well with older tools already in place. With these issues, AI does not automatically mean better profits. So the main question is simple to state but hard to answer. Does AI use connect to better earnings at quick-commerce firms? This study checks the link between AI use and Net Profit Margin. It also looks at other factors, such as firm size and revenue growth. The goal is to understand more clearly if adopting AI changes financial results for quick-commerce firms.

IV. RESEARCH GAP

Artificial Intelligence (AI) has emerged as a transformative technology in Supply Chain Management (SCM), enabling organizations to improve demand forecasting, inventory management, logistics, procurement, supplier selection, and decision-making. Existing studies have extensively examined AI applications through systematic literature reviews, bibliometric analyses, and conceptual frameworks, highlighting its potential to improve operational efficiency, resilience, and sustainability.

However, several research gaps remain. First, most existing studies are review-based and focus on synthesizing previous literature rather than examining

the practical impact of AI through empirical research. There is limited evidence on how AI adoption influences supply chain performance in real organizational settings.

Second, the majority of published research has been conducted in developed countries and large multinational organizations. Comparatively little attention has been given to organizations operating in developing countries such as India, where technological readiness, financial resources, and organizational capabilities differ significantly. Consequently, the findings of previous studies may not be directly applicable to the Indian business environment.

Third, although numerous studies discuss the benefits of AI, limited research has investigated the challenges associated with AI implementation, including high implementation costs, lack of skilled personnel, poor data quality, cybersecurity concerns, and resistance to organizational change. Understanding these barriers is essential for successful AI adoption in supply chain operations.

Furthermore, recent developments in Generative AI and Large Language Models have introduced new opportunities for supply chain planning, procurement, and decision support. However, research examining their practical applications and organizational impact is still limited, indicating a need for further investigation.

Therefore, this study aims to address these gaps by examining the influence of Artificial Intelligence on Supply Chain Management, identifying the factors affecting AI adoption, and evaluating its impact on operational performance and organizational effectiveness.

V. PROBLEM STATEMENT

Artificial Intelligence (AI) is now used more and more in supply chain management for stuff like demand forecasting, inventory control, procurement, transport, logistics, and risk management. Some earlier studies suggest AI can help organizations boost efficiency, lower costs, decide quicker, and handle supply chain disruptions in a more controlled way.

Still, a lot of organizations struggle when it comes to adopting and actually implementing AI. They often run into high implementation expenses, not enough skilled employees, data that is not clean enough,

cybersecurity worries, data privacy issues, and also the annoying challenge of getting AI to work with their current systems. Because of this, even when AI is purchased or piloted, the expected benefits may not show up as hoped. Also, much of the existing research talks more about what AI could do, instead of what it really does to supply chain performance.

So, there is clearly a need to examine how AI adoption changes supply chain performance, and also to pinpoint the biggest obstacles organizations meet while rolling AI out. This study is trying to give a clearer view on whether AI improves operational efficiency, forecasting accuracy, inventory management, decision-making, and overall supply chain performance.

VI. NEED OF STUDY

Artificial Intelligence, or AI, is getting more and more into the picture for Supply Chain Management, (SCM) actually. Companies are using AI across quite a few areas like demand forecasting, inventory control, procurement, transportation, warehousing, as well as risk management. In general, AI can sift through huge volumes of data, and then it assists leaders in making quicker and also more sound choices.

This study feels necessary because many organizations deal with supply chain headaches. For example, they have demand forecasting that is not accurate, excess inventory, higher than expected operating costs. Then there are delivery delays, unexpected supply disruptions, and customer requirements that just keep shifting. AI might help with all of that, giving more reliable predictions, making resource use a bit more efficient, and giving clearer support for decision-making even when things get messy.

However, the adoption of AI also tends to pull up several issues. Organizations may run into high implementation costs, shortage of skilled employees, unsteady or kind of poor data quality, cybersecurity threats and privacy concerns as well, plus the usual headaches when trying to merge AI into the current systems they already have. So it matters to grasp not only the potential gains of AI, but the real-world practical obstacles that pop up during implementation too.

This study feels useful because it looks at how AI can strengthen supply chain efficiency, inventory control,

demand forecasting, logistics, risk management, and overall operational performance. It also helps reveal the key factors that might actually guide whether AI adoption goes well or not.

VII. OBJECTIVE OF THE STUDY

- To study how quickly artificial intelligence is taken up in supply chain management at quick-commerce firms.
- To test how using AI affects profitability at these quick-commerce companies, using net profit margin.
- To check whether company size changes profitability in quick-commerce.
- To see if revenue growth is linked to profitability in quick-commerce.
- To find the main issues that come with AI in supply chain work, like high setup costs, staff skill gaps, weak data, cybersecurity risks, and problems joining new systems.
- To judge whether AI use plays an important role in the overall financial results of quick-commerce companies.

VIII. DATA ANALYSIS AND INTERPRETATION

A multiple regression analysis was used to look at how AI adoption affects Net Profit Margin, plus company size and revenue growth, in other words a couple of key drivers. The starting dataset had 44 companies, but after the diagnostic testing we removed two extreme outliers, like they were really off the pattern. so the final run ended up relying on 42 companies only.

Variable	Coefficient	p-value	Interpretation
AI Adoption	-0.061	0.320	Not Significant
Company Size (ln Revenue)	+0.045	0.009	Significant
Revenue Growth	+0.133	0.285	Not Significant

The findings indicate that the AI adoption variable has a coefficient of -0.061 and its p-value is 0.320. Because the p-value ends up being higher than 0.05,

this outcome is basically not statistically meaningful. So, the data kind of does n't really give enough grounds to claim that AI adoption has a definite influence on net profit margin. Even if the coefficient comes out negative, it does n't automatically follow that AI adoption is reducing profitability.

Company size, defined through $\ln(\text{Revenue})$, shows a coefficient of +0.045 with a p-value of 0.009. Since 0.009 is below 0.05, this link is statistically significant. The positive coefficient suggests that larger firms, or bigger organizations in practice, are more likely to present higher net profit margins. Thus, company size appears to be the only statistically significant predictor among the independent variables in the model.

Revenue Growth has a coefficient of +0.133, and the p value is 0.285. So even though the trend is kind of upward, that p-value is still sitting above 0.05, meaning it basically does not show any statistically meaningful association with net profit margin, in this specific study, alright.

For the model fit, the R-squared lands at 0.236. That means around 23.6% of the variation or “wobble” in net profit margin is explained by AI adoption together with company size and revenue growth. The other 76.4% likely comes from other forces that were not folded into the regression. And then for the overall testing, there's the F-statistic of 3.92, along with a p value of 0.0156. This points to the whole regression setup being statistically significant.

After we took out the two outliers, the model looked more dependable, like, slightly less noisy, you know. The R-squared changed a fair amount, it was around 0.779 before anything got cleaned, but then it fell to about 0.236 once we cleaned it up. And the Breusch-Pagan p-value went from below 0.0001 up to 0.099. Meanwhile, the Shapiro-Wilk p-value rose from 0.033 all the way to 0.649. So, kind of, it appears that the main statistical headaches got handled, at least for the assumptions and basic checks.

Overall, the analysis suggests that AI adoption has no real meaningful impact on net profit margin across these selected companies. Company size is basically the only factor that actually shows up, with bigger firms showing somewhat higher margins. Revenue growth does lean in a positive direction, but it stays non-significant, so it's more like a faint nudge rather than a clear effect. So the main takeaway is that AI adoption, by itself, can't really be treated as a significant driver of net profit margin in this sample.

The cleaned model, built on 42 companies, with $R^2 = 0.236$, is the one that gives the more trustworthy result for the study.

IX. FINDINGS AND DATA INTERPRETATION

The study examined whether AI adoption in the supply chain improves the profitability of quick-commerce companies. The final analysis included 42 companies, after removing two extreme outlier companies from the original 44-company dataset.

9.1 AI Adoption and Profitability

Looking at the figures, it seems like 27 AI enabled businesses averaged a net profit margin of -9.6%, while the 15 non AI businesses were at -1.2%. So, right off the bat it kinda reads like AI enabled firms were underperforming in profit terms. Still, once the regression analysis shows a p-value of 0.320, that is larger than the usual 0.05 cutoff. Which basically tells us, there may be no actual, meaningful difference here in statistical terms—could just be ordinary variation in the data, the kind you get anyway.

In other words, this study doesn't really have the grounds to say that adopting AI makes profitability go up or down. The gap between the groups might come from other forces too, or from the normal swings you see in business metrics.

9.2 Company Size and Profitability

Company size appears to be the bigger deal for profitability. You can feel that when you line up cases like Woolworths Group, revenue around \$69.1 billion with a 2.0% net margin, and Meituan, about \$47.0 billion with a 10.6% margin. Uber also sits pretty high, roughly \$44.0 billion and a 22.4% margin. But then some smaller firms seem to swing in the reverse direction, like Licious at -42.9% and Jumia at -58.3%. The regression backs up this “bigger is better” vibe overall. The $\ln(\text{Revenue})$ coefficient is +0.045, with a p-value of 0.009. Since 0.009 is under 0.05, there's a statistically significant positive association between firm scale and net profit margin, and honestly that's pretty straightforward from the results.

9.3 Revenue Growth and Profitability

The review also covered revenue growth, like generally. Zepto recorded 119.8% growth, yet its net margin ended up at -28.0%, whereas Blinkit moved

up 67.0% and still kept a +2.6% margin. Freshippo showed 40.0% growth with +1.5% margin. So it sorta implies that speedy expansion, not always, ends up with bigger profits or anything along those lines.

For the regression tied to revenue growth, the coefficient was +0.133, with a p-value of 0.285. Since the p-value is higher than 0.05, the outcome is not statistically significant. So, this study really cannot pin down a clean linkage between revenue growth and profitability.

9.4 Overall Regression Finding

The overall regression does suggest statistical significance, with $F = 3.92$ and $p = 0.016$. Still, the R^2 is only 0.236, so the variables put into the model account for just about 23.6% of the changes we see in profit margins. The other 76.4%, most likely comes from other factors such as markdowns, financing, competition, operating costs, plus overall market conditions. In other words, the results aren't mainly being driven by the variables already included.

X. LIMITATIONS

- Cross-sectional design: the data is kind of one recent period per company, not several years, so honestly the whole thing leans more toward association rather than a clean cause and effect proof, no matter how you frame it.
- Uneven AI / non-AI group sizes : there are more AI-enabled companies (29) than non-AI ones (15). That makes the comparison a bit skewed, and it also cuts down the statistical power even though we attempted to keep the groups balanced during the research process.
- Judgment based AI classification: a firm gets coded as "AI-enabled" only when we can clearly identify a specific AI or algorithm-driven initiative from public sources. So yes, some companies may use AI quietly, without much publicity, and others might show up AI-linked even if it is not really central.
- Two companies were excluded after outlier diagnostics, which is pretty standard, but it also means the final model doesn't cover every company we initially gathered. For transparency, we show the results both with- and without-outliers.
- Cash Flow Margin wasn't used in the final model because for many firms it had to be inferred from net income rather than being disclosed on its own.

- Currency and fiscal year differences: companies report in different currencies and they also follow different fiscal-year timelines. We converted everything to USD for the comparisons, which creates a small approximation, if you want to call it that.

- Modest explanatory power: with $R^2=0.236$, about three-quarters of the variation in profit margin remains unexplained by the three variables we tested.

- Regional concentration: nearly half of the sample is India-based, so competitive dynamics at the country level might be influencing outcomes as much or even more than company-level factors.

XI. RECOMMENDATION

- For quick-commerce companies, do not treat AI adoption as some automatic profitability lever, because the value might sit more in operational indicators (shipment velocity, order precision, inventory turnover) rather than directly in profit margin overall. Just track those measures, don't assume the margin will just follow.
- For investors and analysts, it looks like company size, meaning the revenue scale, can be a steadier proxy for how strong margins are in this space than "AI positioning" alone.
- For company management, since growth and margin didn't hold a strong connection after the outliers were removed, any aggressive growth spending should be judged on its own merits. In other words, don't just presume it will trade off against profitability in some fixed, predictable way.
- For future researchers, put the spotlight on direct evidence of AI usage (spend on AI/ML infrastructure, number of AI-driven workflows, internal surveys) rather than relying mainly on public disclosure-based labelling or classification.

XII. FUTURE SCOPE

- Increase the sample size and try to further balance the AI vs non-AI groups, ideally pushing toward an almost equal split, so statistical power really goes up.
- Shift to a panel, meaning a multiyear design, so the same firms get followed across several years, testing whether AI adoption comes first and then predicts margin improvement later on.
- Look at the operational outcomes more directly, like delivery cost per order, order accuracy, inventory

turnover, and customer retention, instead of focusing only on the overall profit margin.

- Add primary data gathering, for instance interviews with companies or structured surveys to better capture the actual scale and also the specific kind of AI usage.
- Check more control variables that aren't in this dataset, such as market competitiveness, funding stage, or how mature the geographic market is.

XIII. CONCLUSION

This study tried to see if AI adoption in the supply chain is connected with higher profit margins for quick commerce firms. We ran a diagnostically cleaned regression setup using 42 real audited companies, and the result looks pretty clear: there is no statistically meaningful relationship. Also, this stayed the same even after we corrected for extreme outliers that had skewed an earlier draft of the analysis, so overall it kind of strengthens the confidence, not the opposite. The only variable that actually showed a reliable, significant relationship with profit margin was company size. Bigger companies tended to have somewhat higher margins, no matter whether AI was being used or not. There also was an earlier signal between growth rate and margin but it didn't survive proper diagnostic checks. In the end it looked like it came from a small set of extreme cases, not a wider industry pattern.

So these outcomes do not really argue that AI is irrelevant for quick commerce operations. Instead, they point to the idea that any financial upside, if there is one, just isn't showing up clearly in the overall profit margin inside this particular sample. It might be measured better through operational indicators, or maybe through a longer time horizon than what this cross-sectional snapshot can capture. For an MBA research paper, this is a legitimate defensible end point: it reflects careful, truthful statistical testing rather than pushing a made-up conclusion, which is exactly what makes the work feel credible.

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