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Digital Supply Chain Integration and Operational Resilience in Indian E-Commerce Msmes: An Analytical Framework

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Abstract- Digital commerce has expanded market access for micro, small and medium-sized enterprises (MSMEs), but operational disruptions, inconsistent inventory visibility, fragmented logistics information and limited coordination continue to affect order fulfilment. Building on the structure of the supplied reference paper—which combines a defined operational problem, process modelling, comparative indicators and table-based interpretation—this manuscript proposes an analytical framework for examining how digital supply chain integration is associated with operational resilience among Indian e-commerce MSMEs. The framework treats information sharing, logistics coordination and digital inventory visibility as explanatory capabilities, with operational resilience reflected through fulfilment reliability, recovery speed and service continuity. A transparent quantitative design is proposed using a firm-level survey and, where available, operational records. To demonstrate how the analysis should be reported, the manuscript includes clearly labelled illustrative tables; these figures are simulated for presentation and are not empirical findings. The paper contributes a context-specific model and a replicable analysis plan that can be tested with verified field data.

Keywords- digital supply chain integration; operational resilience; e-commerce; MSMEs; information sharing; logistics coordination; India

I. INTRODUCTION

Digital platforms allow smaller firms to reach customers beyond their immediate geographic markets. Yet selling through digital channels does not automatically create a reliable fulfilment system. Order information may be distributed across marketplace dashboards, inventory software, courier portals and manual records. When these systems are weakly connected, firms may struggle to detect stock discrepancies, respond to delivery exceptions or coordinate suppliers and logistics partners.

Research on supply chain integration suggests that collaboration and information exchange can support resilience, while research on digital transformation highlights the role of integration in translating technology into operational outcomes (Qi et al., 2023; Jing & Fan, 2024). Evidence concerning Indian MSMEs also indicates that digitising trade and strengthening collaboration are relevant to supply chain effectiveness (Mulchandani et al., 2023). However, MSMEs differ from large firms in financial capacity, technical expertise and bargaining power. It is therefore important to examine operational mechanisms in a context where digital adoption may be partial rather than enterprise-wide.The supplied reference article studies intelligent logistics through indicators such as inventory turnover, order-processing time and transportation cost. The present manuscript retains the comparative, indicator-based logic but changes the focal problem from logistics optimisation in cross-border platforms to digital integration and operational resilience among Indian e-commerce MSMEs. The proposed contribution is a testable model connecting integration capabilities to resilience, with information visibility and coordination considered as mechanisms rather than assuming that technology alone improves performance.

II. RESEARCH PROBLEM AND GAP

Prior work establishes the importance of integration for supply chain resilience and performance, but a focused model is needed to explain how smaller e-commerce firms can use practical integration capabilities to maintain fulfilment during routine disruptions. The gap addressed here is contextual and analytical: the proposed study separates digital integration into observable operational practices and evaluates resilience through service continuity and recovery-related indicators. The gap should be confirmed and refined through a systematic literature search before journal submission.

Research objectives

- To assess the relationship between digital information sharing and operational resilience in Indian e-commerce MSMEs.
- To examine whether logistics coordination is associated with fulfilment reliability and recovery speed.
- To evaluate the contribution of digital inventory visibility to operational continuity.
- To develop a practical measurement and analysis framework that can be replicated using primary data.

III. LITERATURE REVIEW AND THEORETICAL FOUNDATION

The resource-based view considers firm-specific capabilities as potential sources of sustained performance differences. In a digital supply chain, the relevant capability is not merely owning software; it includes routines for capturing, sharing and acting on operational information. Information processing theory complements this view by suggesting that organisations facing uncertainty need sufficient information-processing capacity to coordinate interdependent activities.

Qi et al. (2023) found that information sharing, joint planning and logistics cooperation were positively associated with supply chain resilience in an e-commerce platform setting, while the effect of procurement automation was more complex. This is important because digitalisation should not be treated as a single, uniformly beneficial input. Jing and Fan (2024) examined digital transformation and supply chain integration in listed manufacturing firms, supporting the relevance of integration as a pathway connecting digital activity and supply chain performance. Mulchandani et al. (2023) studied supply chain effectiveness among Indian MSMEs and highlighted the role of collaboration and digitising trade.

These studies support the logic of examining specific capabilities in an MSME context, but their samples, sectors and outcome measures differ. The present framework focuses on e-commerce MSMEs and operational resilience, defined as the ability to sustain or restore order fulfilment when supply, inventory or delivery exceptions occur. This definition should be operationalised consistently in the field instrument.

IV. CONCEPTUAL MODEL AND HYPOTHESES

Digital supply chain integration is represented through three dimensions: (1) information sharing across marketplace, supplier and logistics partners; (2) digital inventory visibility; and (3) logistics coordination, including exception notifications and joint fulfilment planning. Operational resilience is the outcome construct and may be measured using continuity of fulfilment, time to recover from disruptions, and the proportion of orders completed within the promised window.

- H1: Information sharing is positively associated with operational resilience.
- H2: Digital inventory visibility is positively associated with operational resilience.
- H3: Logistics coordination is positively associated with operational resilience.
- H4: The combined digital integration dimensions explain variation in operational resilience after controlling for firm size, e-commerce experience and product category.

Conceptually, the model can be expressed as: $OR = \beta0 + \beta1(IS) + \beta2(IV) + \beta3(LC) + \beta4(FS) + \beta5(EXP) + \beta6(PC) + \varepsilon$, where OR denotes operational resilience, IS information sharing, IV inventory visibility, LC logistics coordination, FS firm size, EXP e-commerce experience and PC product-category controls.

IV. RESEARCH METHODOLOGY

1. Research design

A cross-sectional explanatory design is proposed, with an optional operational-record component to reduce reliance on self-reported perceptions. The target population is Indian MSMEs selling products through online marketplaces or their own e-commerce channels. Eligible respondents should be owners, operations managers, fulfilment managers or employees with direct knowledge of inventory and order processing. A target of 200–300 usable responses would be a practical starting point for multiple regression; final sample adequacy should be justified using an a priori power analysis and the number of predictors.

2. Sampling and data collection

A purposive and snowball sampling strategy may be used through MSME associations, e-commerce seller communities and logistics networks.

The questionnaire should include a consent statement, screening questions and multi-item measures rated on a five-point Likert scale (1 = strongly disagree; 5 = strongly agree). Where firms agree to share operational records, collect anonymised monthly measures for order fulfilment, delivery exceptions and recovery time. Participation must be voluntary, and company-identifying information should be excluded from the analytical dataset.

Measurement plan

Construct	Example Operational Indicators	Suggested Measurement
Information sharing (IS)	Timely exchange of order, stock and delivery-status data; shared exception alerts	3–5 Likert items
Inventory visibility (IV)	Ability to view stock availability and discrepancies across channels	3–5 Likert items
Logistics coordination (LC)	Joint planning, partner communication and response to delivery exceptions	3–5 Likert items
Operational resilience (OR)	Fulfilment continuity, recovery speed and ability to maintain promised service	3–5 Likert items and/or records
Controls	Firm size, firm age, online-selling experience, product category	Categorical/continuous

The proposed items are a starting point, not a validated scale. They should be reviewed by subject experts, piloted with a small group of respondents and refined before the main survey. Internal consistency can be assessed using Cronbach's alpha and composite reliability where appropriate. Construct validity should be examined before testing structural relationships.

Data Analysis Procedure

- Screen the dataset for missing values, duplicate responses, outliers and inconsistent answers; document all exclusions.
- Report respondent and firm profiles, means, standard deviations and correlations.
- Evaluate scale reliability and, where sample size permits, factor structure and convergent/discriminant validity.
- Estimate multiple regression with robust standard errors; inspect multicollinearity using variance inflation factors and review residual diagnostics.
- Report unstandardised and standardised coefficients, confidence intervals, p-values, R^2 and adjusted R^2. Do not interpret association as proof of causation.

V. ANALYSIS TABLES AND INTERPRETATION

Important reporting note: the numerical values in Tables 2–4 below are simulated solely to demonstrate an academic reporting format. They are not collected from Indian MSMEs, must not be represented as actual research findings, and should be replaced by analysis of verified data before submission to a journal.

Table 1. Illustrative profile of a future study sample

Profile variable	Category	Illustrative n	Illustrative %
Firm size	Micro	96	48.0
Firm size	Small	72	36.0
Firm size	Medium	32	16.0
Online-selling experience	Below 3 years	58	29.0
Online-selling experience	3–6 years	84	42.0
Online-selling experience	More than 6 years	58	29.0
Primary channel	Third-party marketplace	118	59.0
Primary channel	Own website/social commerce	42	21.0
Primary channel	Multiple channels	40	20.0

Interpretation: This table demonstrates how the sample composition could be reported for a hypothetical sample of 200 firms. In an actual study, the profile should establish whether micro, small and medium firms and different online-selling models are sufficiently represented. The illustrative percentages sum to 100% within each profile variable; the final paper must use the observed counts and disclose the recruitment method.

Table 2. Illustrative descriptive statistics and correlations

Variable	Mean	SD	1	2	3	4
1. Information sharing	3.62	0.71	1.00			
2. Inventory visibility	3.48	0.76	0.54	1.00		

Variable	Mean	SD	1	2	3	4
3. Logistics coordination	3.57	0.73	0.49	0.52	1.00	
4. Operational resilience	3.51	0.69	0.46	0.50	0.56	1.00

Interpretation: The simulated values illustrate moderate average scores on a five-point scale and positive pairwise associations among the constructs. If similar patterns appear in actual data, they would be consistent with the expectation that firms reporting stronger information sharing, inventory visibility and logistics coordination also report stronger resilience. Correlations alone do not establish statistical significance, direction of causality or the unique contribution of each predictor; these require inferential analysis and controls.

Table 3. Illustrative multiple regression predicting operational resilience

Predictor	Standardised β	Illustrative p-value	Interpretive direction
Information sharing	0.19	0.012	Positive association
Inventory visibility	0.22	0.004	Positive association
Logistics coordination	0.31	<0.001	Positive association
Firm size	0.06	0.310	Not statistically significant
Online-selling experience	0.08	0.180	Not statistically significant

Illustrative model statistics: $R^2 = 0.42$; adjusted $R^2 = 0.40$; overall model $p < 0.001$. These figures are hypothetical and are included only to show the information normally reported.

Interpretation: In this demonstration, logistics coordination has the largest standardised coefficient, followed by inventory visibility and information sharing. If verified results support this pattern, it would suggest that technology creates greater operational value when firms use shared information to coordinate actions across suppliers, marketplaces and delivery partners. The illustrative p-values and model statistics are not evidence for the hypotheses; real estimates, confidence intervals, diagnostics and sample size must be reported.

Table 4. Hypothesis decision template

Hypothesis	Test	Decision rule	Illustrative status
H1: Information sharing → resilience	Regression coefficient for IS	Support only if coefficient is positive and CI excludes zero (or $p < .05$)	Illustrative only
H2: Inventory visibility → resilience	Regression coefficient for IV	Support only if coefficient is positive and CI excludes zero (or $p < .05$)	Illustrative only
H3: Logistics coordination → resilience	Regression coefficient for LC	Support only if coefficient is positive and CI excludes zero (or $p < .05$)	Illustrative only
H4: Combined model adds explanatory value	Adjusted R^2 and overall model test	Compare with control-only model; report change in R^2 and its test	Illustrative only

Interpretation: Hypothesis decisions should follow the pre-specified decision rules and the observed data, rather than being selected to match expectations. Report effect sizes and confidence intervals alongside p-values. If an association is not statistically significant, report that result transparently rather than treating it as proof that no relationship exists.

VI. DISCUSSION

The proposed model advances a practical view of digital integration by distinguishing three operational capabilities. Information sharing makes relevant information available; inventory visibility improves the accuracy and accessibility of stock information; logistics coordination converts information into joint action. This distinction is consistent with the broader evidence that supply chain integration can support resilience, while the consequences of automation

depend on how it is embedded in inter-organisational routines (Qi et al., 2023).

For Indian MSMEs, the practical implication is not necessarily to purchase a complex enterprise platform immediately. Firms may begin by standardising product and order identifiers, reconciling stock across sales channels, establishing clear escalation procedures for exceptions and agreeing on data-sharing routines with logistics partners. Such measures are relatively concrete and can be evaluated through service metrics. Any recommendation about the strongest driver must, however, wait for the actual estimates.

The study also needs to consider resource constraints. Smaller firms may rely on manual processes or third-party platforms and may not have full control over data access. Digital integration can create implementation costs, training needs and cybersecurity risks. A balanced analysis should therefore measure both benefits and barriers rather than assume that more digitalisation is always better.

Managerial and Policy Implications

- MSME managers should define a small set of operational indicators—order accuracy, on-time fulfilment, inventory mismatch and disruption recovery time—and review them consistently.
- Marketplace and logistics partners should clarify data ownership, update frequency, exception codes and escalation responsibilities.
- Industry associations and support agencies can provide low-cost digital-skills training and practical integration guidance for small sellers.
- Researchers and policymakers should distinguish access to digital tools from effective use of shared information in day-to-day coordination.

Limitations and Future Research

The proposed cross-sectional design can identify associations but cannot establish temporal or causal effects. Self-reported responses may be affected by common-method bias, recall error or social desirability. Non-probability sampling may limit generalisability beyond participating firms. Future research could collect monthly operational records, compare platform-dependent and multi-channel sellers, use longitudinal designs, or test whether information visibility mediates the relationship between digital integration and resilience. Before submission, the literature review should be updated through a reproducible database search and the final model should be aligned with the selected journal's scope.

VII. CONCLUSION

This manuscript proposes a testable framework linking digital information sharing, inventory visibility and logistics coordination with operational resilience among Indian e-commerce MSMEs. Following the analytical structure of the supplied paper, it combines operational indicators, a formal model, comparative tables and interpretation. Its principal contribution at this stage is a research design rather than a claim of verified empirical discovery. The next essential step is to collect or obtain a legitimate dataset, run the stated analyses and replace all illustrative values with reproducible results. The manuscript should then be checked for source accuracy, journal fit, reporting completeness and similarity before submission.

REFERENCES

1. Jing, H., & Fan, Y. (2024). Digital transformation, supply chain integration and supply chain performance: Evidence from Chinese manufacturing listed firms. SAGE Open. https://doi.org/10.1177/21582440241281616
2. Mulchandani, K., Jasrotia, S. S., & Mulchandani, K. (2023). Determining supply chain effectiveness for Indian MSMEs: A structural equation modelling approach. Asia Pacific Management Review, 28(2), 90–98. https://doi.org/10.1016/j.apmrv.2022.04.001
3. Qi, Y., Wang, X., Zhang, M., & Wang, Q. (2023). Developing supply chain resilience through integration: An empirical study on an e-commerce platform. Journal of Operations Management, 69(3), 477–496. https://doi.org/10.1002/joom.1226
4. Xie, X. (2026). Intelligent logistics and supply chain optimization of cross-border e-commerce network platform data analysis. Procedia Computer Science, 282, 1807–1815. [Reference model supplied by the user; verify complete bibliographic metadata before citing in a submission.]
5. Miryala, M. (2025). A human-centered continuity platform for public universities: Design, governance, and measured operational impact.