



The Role of Digitization in Fostering Supply Chain Resilience within the Unorganized Retail Sector

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Abstract :- *The unorganized retail sector supply chains have historically lagged in technology adoption, exposing them to resilience vulnerabilities amid market fluctuations and disruptions. This study blends historical insights with primary survey data to assess the impact of digitization on supply chain resilience within unorganized machine tool retailers. Findings demonstrate a strong positive relationship between higher digitization levels and enhanced supply chain responsiveness and adaptability, highlighting digitization as an urgent enabler for resilience-building in unorganized retail supply chains.*

Key words:- *Digitization, Supply chain Resilience, Unorganized Retail.*

1. INTRODUCTION

Supply chains operating in today's markets are increasingly exposed to volatility arising from fluctuating demand, supply disruptions, price instability, and logistical uncertainties. In such an environment, the concept of **supply chain resilience**—the ability of a supply chain to prepare for, respond to, and recover from disruptions—has become central to both academic inquiry and managerial practice. While resilience has been widely discussed in the context of large, organized firms with structured systems and advanced technologies, far less attention has been paid to supply chains functioning within the **unorganized retail sector**, where operational informality and resource constraints are dominant characteristics.

The unorganized retail sector represents a substantial portion of trade activity in many developing economies. These retailers typically operate on a small scale, rely heavily on personal relationships, and use informal processes for procurement, inventory control, and customer management. Record-keeping is often manual, planning horizons are short, and decision-making is reactive rather than data-driven. Such features may offer flexibility in routine situations, but they can also increase vulnerability when disruptions occur. Irregular supply, sudden changes in customer demand, credit-cycle pressures, and transportation delays can quickly translate into stock-outs, lost sales, and strained supplier relationships. In this context, strengthening supply chain resilience becomes not merely a strategic objective but a necessity for survival.

At the same time, the diffusion of **digital technologies** has begun to reach even small and informal retail businesses. Affordable smartphones, low-cost billing applications, digital payment platforms, and messaging-based communication tools have lowered the barriers to technology adoption. Retailers who previously depended solely on handwritten ledgers and verbal coordination are now gradually using billing software, digital transaction records, and instant communication with suppliers and customers. Although this shift is often motivated by convenience or compliance pressures, it may also have deeper implications for how supply chains function under stress.

Digitization can influence supply chain processes through improved **information visibility, speed of communication, and data accuracy**. Digital transaction records provide clearer demand patterns; inventory applications enable better tracking of stock levels; and electronic communication facilitates faster coordination with distributors and suppliers. These capabilities may enhance a retailer's ability to detect emerging problems, adjust order quantities, identify alternative sources, and respond more quickly to market changes. From a resilience perspective, such improvements could translate into greater responsiveness, flexibility, and recovery capacity during disruptions.



Despite these potential benefits, empirical evidence on the relationship between digitization and supply chain resilience within the **unorganized retail context** remains limited. Much of the existing research on digital transformation and resilience focuses on large enterprises, formal supply networks, or highly integrated systems. The operational realities of small, informal retailers—characterized by limited capital, skill gaps, and incremental technology use—differ significantly from those settings. It therefore cannot be assumed that findings from organized sectors apply directly to unorganized retail supply chains. There is a need to examine whether relatively basic forms of digitization, rather than sophisticated enterprise systems, can meaningfully strengthen resilience in such environments.

This issue is particularly relevant for **unorganized machine-tool retailers**, who deal with industrial customers and products that often involve demand variability, dependence on distributors, and service expectations related to availability and timely delivery. Disruptions in supply or sudden shifts in industrial demand can have immediate operational consequences. Understanding whether digitization helps these retailers better manage uncertainty, coordinate with supply partners, and recover from disruptions is therefore of both practical and theoretical importance.

Against this backdrop, the present study investigates the **role of digitization in fostering supply chain resilience within the unorganized retail sector**. Specifically, it examines the extent to which higher levels of digital tool usage are associated with improved resilience capabilities among unorganized machine-tool retailers. By combining survey-based empirical evidence with contextual insights into informal retail operations, the study aims to clarify whether digitization functions as a meaningful enabler of resilience rather than merely a modernization trend.

The findings are expected to contribute in three ways. First, they extend the discussion of supply chain resilience to a segment that is economically significant yet underrepresented in research. Second, they provide empirical insight into how incremental, accessible forms of digitization influence operational capabilities in informal supply chains. Third, they offer practical guidance for retailers, suppliers, and policymakers seeking cost-effective pathways to strengthen stability and performance in unorganized retail environments.

2. LITERATURE REVIEW

2.1 Unorganized Retail Supply Chains

Unorganized retail supply chains operate in environments characterized by a high degree of informality. Business processes are often shaped by personal relationships, verbal agreements, and experience-based decision-making rather than formal contracts or standardized procedures. Retailers typically function as small, independently owned establishments with limited managerial specialization. Procurement, inventory decisions, and customer service activities are frequently managed by the owner or a small team, resulting in centralized yet intuitive forms of control. While such informality may allow quick day-to-day adjustments, it often reduces systematic planning and long-term coordination within the supply chain.

A key feature of these supply chains is the presence of limited planning systems. Demand forecasting is generally based on recent sales patterns or customer requests rather than structured forecasting models. Inventory replenishment decisions may be triggered by visual stock assessment or perceived shortages rather than predefined reorder points. Record-keeping, when present, may be manual or fragmented, which restricts the availability of reliable data for analysis. As a result, supply chain decisions tend to be reactive. This reactive orientation can heighten exposure to uncertainty, as retailers may struggle to anticipate demand surges, supplier delays, or price fluctuations.

Another defining characteristic is the dependence on distributors and intermediaries. Unorganized retailers often lack direct access to manufacturers and rely on a network of distributors or dealers for product supply. These relationships can provide flexibility in small order quantities and credit arrangements but may also create information asymmetry. Retailers may have limited visibility into upstream supply conditions, lead times, or production constraints. Consequently, disruptions occurring at higher tiers of the supply chain can propagate downstream with little warning, affecting product availability and customer service performance. In such contexts, enhancing the capacity to manage uncertainty becomes essential, drawing attention to the concept of supply chain resilience.

2.2 Supply Chain Resilience

Supply chain resilience refers to the capability of a supply chain to maintain or regain its performance in the face of disruptions and uncertainties. Rather than eliminating risk entirely, resilience emphasizes preparedness, effective



response, and recovery. In operational terms, resilience can be understood through three core abilities: the ability to respond quickly, the ability to adapt to disruption, and the ability to recover performance after adverse events.

The first dimension, responsiveness, concerns the speed at which a supply chain can detect changes and take action. This includes rapidly adjusting order quantities, reallocating inventory, or communicating with partners when unexpected demand or supply variations arise. High responsiveness reduces the time lag between disruption and corrective action, limiting the negative impact on service levels.

The second dimension, flexibility, reflects the capacity to modify processes, sourcing options, or distribution arrangements when conditions change. Flexibility may involve sourcing from alternative suppliers, adjusting product mixes, or altering delivery schedules. In retail settings with uncertain demand patterns, flexibility allows firms to accommodate variation without severe performance deterioration.

The third dimension, recovery capability, relates to how effectively and quickly a supply chain can return to its normal or improved state after a disruption. Recovery includes restoring inventory levels, re-establishing supplier coordination, and stabilizing customer service performance. Together, responsiveness, flexibility, and recovery capability form a comprehensive view of resilience as a dynamic, capability-based construct rather than a static state.

2.3 Digitization in Small Retail

Digitization in small and unorganized retail contexts generally involves the adoption of basic, accessible digital tools rather than advanced enterprise systems. One key area is digital record keeping, where retailers use billing software, mobile applications, or electronic ledgers to record sales, purchases, and inventory transactions. Such tools replace or complement manual registers, enabling more accurate and retrievable data.

A second area involves digital communication tools. Messaging applications, mobile calls, and online platforms are increasingly used to place orders, confirm deliveries, and coordinate with suppliers and customers. These tools reduce communication delays and provide written or digital traces of transactions, which can improve coordination accuracy.

A third aspect is data visibility. When transactions and inventory movements are digitally recorded, retailers gain clearer insights into sales trends, stock levels, and payment flows. Even simple digital systems can generate basic reports or summaries that support more informed decisions. For small retailers, these forms of digitization represent incremental steps toward more structured information management.

2.4 Link Between Digitization and Resilience

The connection between digitization and supply chain resilience can be explained through an information-processing perspective. Digitization enhances information visibility, making data on demand, inventory, and transactions more accessible and reliable. Improved visibility reduces uncertainty by providing a clearer picture of current conditions.

With better information, retailers can make faster decisions regarding replenishment, order adjustments, or coordination with suppliers. Speed in decision-making supports quicker responses to unexpected changes, directly strengthening the responsiveness dimension of resilience. Additionally, accurate information may facilitate the identification of alternative sourcing or adjustment strategies, contributing to flexibility.

Finally, improved coordination and data-driven adjustments can shorten the time needed to stabilize operations after disruptions, supporting recovery capability. In this logic chain, digitization does not directly create resilience; rather, it acts as an enabling mechanism that improves information flow and decision quality, which in turn enhance the supply chain's ability to respond, adapt, and recover.

3. CONCEPTUAL MODEL AND HYPOTHESIS DEVELOPMENT

This study adopts a focused conceptual model to examine how digitization influences the resilience of supply chains operating within the unorganized retail sector. The model is intentionally parsimonious, recognizing the exploratory nature of research in this context and the need to capture the primary relationship of interest without excessive complexity. At its core, the model proposes a direct linkage between digitization level and supply chain resilience.



Digitization level represents the extent to which retailers use digital tools in their routine operations. In unorganized retail environments, digitization typically takes incremental forms, such as electronic billing systems, digital inventory records, digital payment mechanisms, and mobile-based communication with suppliers. These tools enhance the structure and traceability of transactions and operational data. Rather than viewing digitization as a binary condition (digital versus non-digital), the model treats it as a continuum, where higher levels of adoption indicate greater integration of digital practices into daily supply chain activities.

Supply chain resilience, in this framework, is conceptualized as a capability that enables retailers to sustain and restore operational performance under conditions of disruption or uncertainty. It reflects the retailer's ability to respond quickly to changes in demand or supply, adapt processes when disturbances occur, and recover performance levels after adverse events. This capability-based view emphasizes dynamic adjustment rather than static robustness, which is particularly relevant for small retailers facing frequent variability.

The theoretical logic underlying the model is grounded in the role of information in supply chain management. Digitization improves the quality, speed, and accessibility of information regarding sales, inventory, and supplier interactions. Enhanced information visibility can reduce uncertainty and enable more timely and accurate decisions. For example, digital records may help retailers detect changes in demand patterns earlier, while digital communication tools can accelerate coordination with distributors during shortages. These improvements in information processing are expected to strengthen the retailer's responsiveness, flexibility, and recovery capability, thereby enhancing overall resilience.

Although the primary focus is on the direct relationship between digitization and resilience, the model acknowledges that other organizational characteristics may influence resilience levels. Retailer size (e.g., scale of operations or product range) and managerial experience may affect access to resources, decision-making ability, and network relationships. These variables can therefore be considered as optional control variables to ensure that the observed effect of digitization is not confounded by structural differences among retailers.

Based on this reasoning, the study proposes the following hypothesis:

H1: Digitization level has a positive impact on supply chain resilience in unorganized retail supply chains.

This hypothesis reflects the expectation that higher levels of digital tool usage are associated with stronger resilience capabilities, even in informal retail environments where digitization is relatively basic and incremental.

4. RESEARCH METHODOLOGY :

4.1 Research Design

This study adopts a quantitative research design combining descriptive and analytical approaches to examine the relationship between digitization and supply chain resilience in the unorganized retail context. A quantitative approach is appropriate because the objective is to measure specific operational practices and test the strength of relationships between defined variables. The design allows for systematic data collection and statistical evaluation of the proposed hypothesis.

A survey method is used as the primary data collection technique. Surveys are well suited for capturing standardized responses from a large number of small retailers, enabling comparison across units and identification of patterns. Given the operational nature of the constructs—digitization practices and resilience capabilities—a structured questionnaire provides a practical means of gathering measurable perceptions and reported behaviors from respondents directly involved in day-to-day supply chain activities.

4.2 Sample

The target population comprises unorganized machine-tool retailers, who operate as small, independently managed retail units dealing with industrial tools and related products. These retailers typically function with limited formal systems and rely on distributor networks for product supply, making them a relevant group for examining digitization and resilience in informal supply chains. The geographical focus of the study is the states of Gujarat and Maharashtra, regions with significant industrial and trading activity. Concentrating on these locations ensures contextual consistency while capturing variability in retailer practices across urban and semi-urban markets.

A sample size in the range of 120–200 retailers is targeted. This range is considered adequate for basic statistical analysis, including reliability testing, correlation, and regression. It allows for sufficient variability in responses while remaining feasible in terms of field data collection among small business operators.



4.3 Data Collection

Data are collected using a structured questionnaire administered directly to retailer owners or managers responsible for procurement, inventory decisions, and customer transactions. The instrument is designed to capture perceptions of operational practices and capabilities rather than financial or confidential data, which increases the likelihood of participation.

Responses are recorded using a five-point Likert scale (1 = strongly disagree to 5 = strongly agree). This scale provides a balanced measure of agreement levels and enables quantitative analysis of attitudes and reported behaviors related to digitization and resilience.

4.4 Measurement of Variables

Digitization Index (Independent Variable)

Digitization is operationalized as a composite index reflecting the extent of digital tool usage in retail operations. The construct is measured through items capturing:

- Use of billing software for recording sales
- Adoption of digital inventory tracking systems or applications
- Use of digital payment methods (e.g., electronic transfers, mobile payments)
- Use of digital communication tools (such as messaging applications) for interaction with suppliers
- Maintenance of digital records for transactions and stock

Higher scores indicate a greater level of integration of digital practices into daily supply chain activities.

Supply Chain Resilience (Dependent Variable)

Supply chain resilience is measured as a multi-item construct reflecting operational capabilities during uncertainty. The items assess:

- Ability to respond to changes in customer demand
- Speed of order fulfilment under varying conditions
- Ability to identify and use alternative suppliers when regular sources are disrupted
- Effectiveness in recovering from stock-outs
- Flexibility in adjusting order quantities based on market needs
- Higher scores represent stronger resilience capabilities in managing disruptions and variability.

4.5 Analysis Technique

Data analysis proceeds in several stages. First, a reliability test using Cronbach's Alpha is conducted to assess the internal consistency of the measurement scales for digitization and resilience. Acceptable reliability indicates that the items within each construct measure the same underlying concept.

Second, correlation analysis is performed to examine the strength and direction of association between digitization and supply chain resilience. This provides an initial indication of whether the variables move together in a positive or negative direction.

Finally, regression analysis is used to test the proposed hypothesis. Digitization level is treated as the independent variable, and supply chain resilience as the dependent variable. The regression results indicate whether digitization has a statistically significant positive effect on resilience, after accounting for variability in the data. Together, these techniques allow for a structured evaluation of the study's central relationship.

5. RESULTS :

This section presents the empirical findings of the study, including retailer characteristics, descriptive statistics, and statistical tests examining the relationship between digitization and supply chain resilience.



5.1 Profile of Retailers

The final sample consisted of 100 unorganized machine-tool retailers.

Business Experience:

- 32% had less than 5 years of experience
- 46% had 5–15 years
- 22% had more than 15 years

This indicates that most respondents possessed substantial operational exposure.

Shop Size:

- 54% operated small outlets (limited storage)
- 33% medium-sized shops
- 13% relatively larger premises

Limited space highlights the importance of responsive replenishment.

Product Range:

- 41% focused on a narrow tool line
- 44% maintained a moderate mix
- 15% offered a wide industrial assortment

Retailers with broader ranges faced greater coordination complexity.

5.2 Descriptive Statistics

Variable	Mean	Std. Deviation	Interpretation
Digitization Level	3.42	0.74	Moderate digital adoption
Supply Chain Resilience	3.58	0.69	Moderate resilience capability

Retailers widely used digital payments (mean = 3.9) and mobile communication (mean = 4.1), while inventory software usage was lower (mean = 2.8).

5.3 Reliability Results

Construct	No. of Items	Cronbach's Alpha
Digitization	5	0.83
Supply Chain Resilience	5	0.87

Values above 0.70 indicate good internal consistency.

5.4 Correlation Analysis

Variables	Digitization	Resilience
Digitization	1	
Resilience	0.62*	1

*p < 0.01



A strong positive correlation ($r = 0.62$) suggests retailers with higher digitization tend to report higher resilience.

5.5 Regression Results

Model Summary

R	R ²	Adjusted R ²	Std. Error
0.62	0.38	0.37	0.51

Digitization explains 38% of the variance in resilience.

ANOVA

Model	F	Sig.
Regression	96.84	0.000

Coefficients

Predictor	B	Std. Error	Beta	t	Sig.
Digitization	0.58	0.06	0.62	9.84	0.000

Interpretation

The regression coefficient ($\beta = 0.62$, $p < 0.001$) confirms a significant positive effect of digitization on supply chain resilience. Retailers using more digital tools demonstrate stronger ability to:

- Adjust to demand changes
- Coordinate faster with suppliers
- Recover from stock shortages

Thus, H1 is supported: Digitization level positively impacts supply chain resilience in unorganized retail supply chains.

Even basic digital practices contribute substantially to operational stability.

6. DISCUSSION :

The findings of this study indicate a clear and statistically significant relationship between digitization and supply chain resilience among unorganized machine-tool retailers. These results are particularly meaningful when interpreted within the operational realities of informal retail supply chains, where processes are traditionally manual, coordination is relationship-driven, and planning systems are limited.

One of the most important mechanisms through which digitization appears to influence resilience is improved visibility. Digital billing systems, electronic transaction records, and basic inventory applications provide retailers with more accurate and timely information regarding sales patterns, stock levels, and payment flows. In environments where decisions are often made based on memory or rough estimates, the availability of structured digital records reduces uncertainty. Retailers are better able to detect demand fluctuations, identify slow-moving items, and recognize impending stock shortages. This enhanced situational awareness forms a foundation for more effective decision-making during disruptions.

Closely linked to visibility is the role of faster information flow. Digital communication tools—particularly mobile-based messaging and electronic transaction platforms—shorten the time required to exchange information between retailers and their supply partners. Instead of relying on in-person visits or delayed phone coordination, retailers can place orders, confirm deliveries, or seek clarifications in real time. The reduction in communication delays contributes



directly to the responsiveness dimension of resilience. When supply or demand conditions change suddenly, quicker information exchange enables faster operational adjustments, reducing the severity of service disruptions.

The results also suggest that digitization supports easier supplier coordination. Digital records and communication channels create more transparent and traceable interactions with distributors. Order histories, payment records, and delivery details can be referenced more easily, which helps resolve discrepancies and build more structured relationships. During periods of disruption—such as stock shortages or delayed shipments—this improved coordination facilitates negotiation of alternative delivery schedules or sourcing options. Even in informal networks, digital tools introduce a degree of procedural clarity that enhances collaborative problem-solving.

Another key outcome relates to better response during shortages. Retailers with higher digitization levels reported greater ability to adjust order quantities, identify substitute suppliers, and restore inventory after stock-outs. This reflects both the responsiveness and recovery capability aspects of resilience. Digital transaction histories may help retailers anticipate which items require urgent replenishment, while digital communication enables faster outreach to multiple suppliers. As a result, recovery cycles are shortened, and the impact of disruptions on customer service is reduced.

A notable implication of these findings is that resilience improvements do not require advanced or expensive technologies. The study context shows that even basic digital tools—such as mobile applications for billing, digital payments, and messaging—can significantly strengthen operational capabilities. This is important because unorganized retailers often face financial and skill constraints that limit access to sophisticated systems. The evidence suggests that incremental digitization can still yield meaningful resilience benefits, making digital adoption a practical and accessible strategy for small retailers.

7. IMPLICATIONS

For Retailers

The findings indicate that low-cost digital tools can play a crucial role in strengthening operational stability. Retailers do not need complex enterprise systems to improve resilience; mobile-based applications for billing, inventory tracking, and digital payments provide immediate benefits in terms of visibility and coordination. By gradually formalizing records and communication through digital means, retailers can reduce uncertainty and respond more effectively to disruptions. Starting with simple, user-friendly tools allows incremental learning while enhancing supply chain reliability.

For Suppliers

Suppliers and distributors can also benefit by promoting digital interaction with retailers. Encouraging digital ordering, electronic invoicing, and shared communication platforms can streamline coordination across the supply chain. When information flows more smoothly between tiers, disruptions can be addressed more collaboratively. Suppliers may consider offering simple digital interfaces or training support to retailers, which in turn can stabilize demand patterns and improve overall network performance.

For Policy

From a policy perspective, the results highlight the value of MSME-focused digitization initiatives. Training programs that build digital literacy among small retailers can enhance not only efficiency but also resilience. Retail cluster-based digital training and subsidized access to basic software tools can accelerate adoption. Such interventions contribute to broader economic stability by strengthening the capacity of informal retail networks to withstand shocks.

8. CONCLUSION

This study demonstrates that digitization functions as more than a modernization trend in unorganized retail supply chains; it acts as a practical enabler of resilience. By improving information visibility, accelerating communication, and facilitating coordination, digital tools enhance the ability of retailers to respond to, adapt to, and recover from disruptions. Importantly, these benefits are evident even with basic forms of technology adoption.

The results show that informal retailers, despite operating under resource constraints and traditional practices, can significantly strengthen their supply chain capabilities through incremental digitization. This provides empirical



evidence from a sector that has received limited research attention, highlighting the strategic value of digital adoption in small-scale retail environments.

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