

Exploring Supply Chain Risk Mitigation Strategies among Manufacturing Firms: A Qualitative Multiple-Case Study in Makassar, Indonesia

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ABSTRACT: Global supply chains face growing vulnerability from pandemics, geopolitical instability, and logistics uncertainty, making risk management a strategic priority. This study investigates determinants of supply chain risk mitigation strategies, implementation challenges, and resilience-building practices among manufacturing firms in Makassar, Indonesia. Using a qualitative multiple-case study design, semi-structured interviews were conducted with supply chain, procurement, and operations managers across multiple manufacturing subsectors, analyzed through thematic analysis combining open, axial, and selective coding with cross-case comparison. Findings reveal that supplier reliability and business continuity are the primary mitigation determinants, with firms prioritizing production continuity over short-term cost efficiency. Implementation is constrained by financial limitations, inter-island logistics uncertainty, limited supplier transparency, and uneven digital integration. Firms respond by combining supplier diversification, long-term partnerships, collaborative planning, strategic inventory, and cross-functional coordination. Resilience emerges through the interaction of relational, organizational, informational, and structural capabilities rather than any single mechanism. The study contributes qualitative evidence from an emerging economy context, demonstrating that effective mitigation strategies are shaped by organizational capabilities, contextual conditions, and collaborative relationships, while offering policy insights for improving logistics infrastructure, digital integration, and regional supply chain collaboration.

Keywords: Supply Chain Risk Management, Supply Chain Resilience, Manufacturing Firms, Qualitative Multiple-Case Study, Risk Mitigation, Supplier Collaboration, Business Continuity.



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INTRODUCTION

Global manufacturing supply chains have become increasingly vulnerable to disruptive events over the past decade, with the COVID-19 pandemic representing one of the most significant stress tests for modern supply networks. The pandemic exposed structural weaknesses in sourcing, production, logistics, and information exchange, while subsequent geopolitical conflicts,

inflationary pressures, climate-related disasters, and transportation bottlenecks have continued to amplify uncertainty across global manufacturing systems. These disruptions have demonstrated that supply chain risks are no longer isolated operational incidents but interconnected events capable of propagating rapidly across multiple supply chain tiers through ripple effects, demand–supply imbalances, and information bottlenecks, ultimately affecting organizational performance, competitiveness, and long-term sustainability (Fernando et al., 2023; Taghavi et al., 2023; Tordecilla et al., 2021). Consequently, manufacturing firms are increasingly expected to develop proactive capabilities that enable them to anticipate disruptions, respond effectively, and recover while maintaining operational continuity.

The increasing complexity of global supply networks has elevated Supply Chain Risk Management (SCRM) from a supporting operational function to a strategic organizational capability (Das & Perona, 2025). Recent literature emphasizes that resilient manufacturing systems require end-to-end visibility, flexible production processes, diversified sourcing strategies, collaborative supplier relationships, and digital technologies capable of supporting real-time decision-making (Holgado & Niess, 2023; Kashem et al., 2024; Schwellnus et al., 2023). Manufacturing organizations operating within globally connected supply chains must therefore balance efficiency and resilience by integrating risk identification, mitigation, monitoring, and recovery into routine managerial practice. Contemporary SCRM research increasingly recognizes resilience as a complementary organizational capability rather than merely the absence of risk, highlighting that organizations capable of adapting to disruptions often outperform those relying solely on efficiency-oriented supply chain designs (Benedito et al., 2020; Handfield & Burns, 2020).

Supply Chain Risk Management is widely defined as the systematic process of identifying, assessing, monitoring, and mitigating risks throughout interconnected supply chain activities through coordinated actions among supply chain members (Lawrence et al., 2020; Thompson et al., 2025; Zuniga, 2022). These coordinated activities aim to reduce organizational vulnerability while preserving operational performance during uncertain conditions. Closely related to SCRM is the concept of supply chain resilience, which refers to the capability of organizations to anticipate disruptions, absorb their impacts, respond effectively, and recover within an acceptable timeframe while sustaining or even improving organizational performance (Zhu et al., 2023). Unlike traditional risk management approaches that primarily emphasize risk avoidance, resilience-oriented perspectives focus on developing organizational capabilities such as flexibility, redundancy, visibility, collaboration, and adaptive learning that enable firms to function under continuously changing environments (Eberi-Kalu, 2024).

Manufacturing firms are particularly exposed to supply chain disruptions because their operations depend on extensive networks of suppliers, logistics providers, distributors, and customers. Previous studies classify manufacturing supply chain risks into several major categories, including supply disruptions, demand uncertainty, supplier dependency, transportation and logistics disruptions, information system failures, cyber-security threats, and macro-environmental risks arising from political instability, economic volatility, natural disasters, and public health crises (Lawrence et al., 2020; Zuniga, 2022). The rapid adoption of digital technologies associated with Supply Chain 4.0 has created new opportunities for proactive risk monitoring through artificial intelligence, Internet of Things technologies, blockchain, and big data analytics, while

simultaneously introducing additional cyber-security and information-sharing challenges (Hsu et al., 2022; Ifikhar et al., 2023). These developments suggest that effective supply chain risk mitigation requires not only technological investment but also strong organizational coordination, supplier collaboration, and managerial decision-making capabilities.

Existing research further demonstrates that organizational vulnerability increases when manufacturing firms depend heavily on single suppliers, maintain limited visibility across supply chain tiers, operate highly interconnected supply networks, or lack comprehensive contingency planning. The interaction between organizational vulnerabilities and available capabilities largely determines supply chain resilience outcomes, with supplier diversification, strategic inventory, flexible sourcing, regionalization, collaborative planning, and information transparency consistently identified as important resilience enablers (Schwellnus et al., 2023; Taghavi et al., 2023; Zhu et al., 2023). Following the COVID-19 pandemic, numerous studies have also highlighted the growing importance of digitalization, data-driven decision-making, and real-time information visibility in strengthening organizational responsiveness to disruptions (Hald & Coslugeanu, 2021; Kashem et al., 2024). These strategic capabilities enable organizations not only to recover more rapidly from disruptions but also to enhance long-term competitiveness within increasingly uncertain business environments.

Despite substantial progress in SCRM research, several important knowledge gaps remain. First, the majority of existing studies rely on quantitative methods, optimization models, simulation techniques, and large-scale surveys that primarily examine statistical relationships among predefined variables. Although these approaches provide valuable insights into disruption propagation, network optimization, and resilience measurement, they offer limited understanding of how managers actually interpret risks, prioritize mitigation alternatives, and make decisions during operational uncertainty (Fernando et al., 2023; Magableh et al., 2024). Second, empirical evidence remains heavily concentrated in developed economies, while comparatively fewer studies investigate manufacturing firms operating in emerging economies where institutional conditions, logistics infrastructure, technology adoption, and policy environments differ substantially (Holgado & Niess, 2023; Sánchez-Sellero et al., 2014; Uchenna & Ugochukwu, 2021). Consequently, existing theoretical frameworks may not fully capture the contextual realities faced by manufacturing organizations in Southeast Asia.

Indonesia represents an important yet underexplored context for qualitative SCRM research. As Southeast Asia's largest manufacturing economy, Indonesia depends extensively on geographically dispersed supplier networks and inter-island logistics systems. Within this context, Makassar serves as the largest industrial, commercial, and logistics hub in Eastern Indonesia, connecting manufacturing activities across Sulawesi, Kalimantan, Maluku, Papua, and Nusa Tenggara. Manufacturing firms located in Makassar routinely encounter operational risks associated with inter-island transportation delays, fluctuating raw material availability, increasing logistics costs, changing customer demand, and varying levels of digital maturity among supply chain partners. These contextual characteristics make Makassar an appropriate setting for examining how manufacturing managers formulate and implement supply chain risk mitigation strategies under complex environmental conditions (Kushal et al., 2018). Furthermore, regional assessments have emphasized the importance of context-sensitive SCRM frameworks that reflect differences in

digital adoption, policy support, supply chain transparency, and regional collaboration across Southeast Asia (Jomthanachai et al., 2022).

Motivated by these research gaps, the present study adopts a qualitative multiple case study approach to investigate how manufacturing firms in Makassar identify determinants of supply chain risk mitigation, implement mitigation strategies, and overcome operational challenges. By exploring managerial experiences across multiple manufacturing subsectors, the study seeks to uncover organizational routines, decision-making processes, collaborative practices, and contextual factors that cannot be adequately explained through quantitative methods alone. Specifically, the research addresses four questions concerning the identification of supply chain risks, the determinants influencing mitigation strategy selection, the challenges encountered during implementation, and the organizational practices that contribute to effective risk management. Through thematic analysis of interview data collected from manufacturing managers, procurement managers, supply chain managers, operations managers, production managers, and manufacturing directors, this study develops an empirically grounded conceptual understanding of supply chain risk mitigation within Indonesian manufacturing firms (Nurjanah et al., 2026).

The study contributes to the existing Supply Chain Risk Management literature in several ways. Theoretically, it extends qualitative SCRM scholarship by integrating managerial decision-making, organizational capabilities, and contextual characteristics into a comprehensive explanation of supply chain risk mitigation within an emerging economy. Practically, the findings provide manufacturing managers with evidence-based guidance for strengthening supplier collaboration, improving information sharing, enhancing operational flexibility, and developing resilient mitigation strategies under uncertain conditions. From a policy perspective, the study offers insights for government agencies, industrial associations, and logistics stakeholders seeking to strengthen national supply chain resilience through improved infrastructure, digital transformation, and collaborative industrial ecosystems. By addressing the qualitative research gap identified in previous studies and providing empirical evidence from an important manufacturing region in Southeast Asia, this research advances both academic understanding and practical implementation of supply chain risk mitigation strategies in contemporary manufacturing environments.

METHOD

Research Design

This study employed a qualitative multiple-case study design to investigate the determinants and implementation challenges of supply chain risk mitigation strategies among manufacturing firms in Makassar, Indonesia. This design was selected because Supply Chain Risk Management (SCRM) is an organizational and interorganizational phenomenon that is shaped by managerial interpretation, operational routines, supplier relationships, information-sharing practices, and contextual conditions. These dimensions are difficult to capture adequately through quantitative measures alone because they involve processes, experiences, and decisions that develop within specific organizational settings.

Qualitative case study research provides a rich and contextually grounded understanding of how firms identify, interpret, and respond to supply chain disruptions. It enables researchers to examine the human, organizational, and interorganizational dimensions of SCRM, including trust, coordination, managerial judgment, and risk culture, which may remain obscured in statistical models or survey-based research (Khan et al., 2023). This approach is particularly suitable for examining how manufacturing managers balance cost efficiency, business continuity, supplier reliability, and operational flexibility when selecting mitigation strategies.

A multiple-case design was preferred over a single-case design because it permits systematic comparison across manufacturing firms and subsectors. Cross-case analysis helps identify recurring patterns, contextual differences, and contingent factors that influence risk mitigation practices. Click or tap here to enter text.. It also strengthens the analytical value of the study by allowing findings from one organizational setting to be compared with those emerging from other cases. The resulting explanations are therefore based not only on the characteristics of an individual firm but also on similarities and variations across several manufacturing contexts.

This methodological choice also responds directly to the limited qualitative evidence on SCRM implementation in emerging economies. Although quantitative methods such as simulation, Bayesian networks, optimization models, and network design provide valuable measurements of vulnerability and resilience, qualitative multiple-case studies can explain how SCRM concepts operate in practice and support the development of context-sensitive theoretical frameworks (Agrawal et al., 2022). This is especially relevant in Southeast Asia, where logistics conditions, digital maturity, policy environments, and interorganizational relationships may differ from those commonly examined in developed economies (Holgado & Niess, 2023; Magableh et al., 2024).

Research Setting

The study was conducted in Makassar, South Sulawesi, Indonesia. Makassar was selected because it is a major industrial, commercial, and logistics center in Eastern Indonesia. The city supports manufacturing and distribution activities serving Sulawesi, Kalimantan, Maluku, Papua, and Nusa Tenggara. Its manufacturing firms depend substantially on inter-island logistics, geographically dispersed suppliers, shipping schedules, port operations, and fluctuating raw material availability.

These characteristics make Makassar a relevant setting for examining supply chain risk mitigation. Firms operating in the region frequently encounter transportation delays, port congestion, changing fuel prices, uncertain shipping capacity, raw material shortages, demand fluctuations, and uneven digital integration among supply chain partners. The research setting therefore provides an appropriate context for investigating how organizational and environmental conditions influence mitigation decisions in an emerging-economy supply network.

The cases represented several manufacturing subsectors, including food, packaging, furniture, and plastic manufacturing. The inclusion of different subsectors supported comparison of sector-specific risks and organizational responses. For example, food manufacturing may be more exposed to material perishability and continuity requirements, while furniture firms may face timber shortages and supplier concentration. Packaging and plastic manufacturers may be

particularly affected by transportation uncertainty, imported inputs, and production interruptions. These differences enabled the study to examine both shared and context-dependent SCRM practices.

Case and Participant Selection

The study used purposive sampling to select firms and participants with direct knowledge of supply chain risk management. Case selection focused on manufacturing firms experiencing supply, procurement, production, inventory, or logistics uncertainty and applying identifiable risk mitigation practices. This sampling logic ensured that the selected cases could provide detailed evidence relevant to the research questions.

Participants were selected according to their involvement in supply chain decision-making and disruption management. The informant categories included manufacturing directors, manufacturing managers, supply chain managers, procurement managers, production managers, and operations managers. These positions were considered appropriate because they were directly responsible for supplier evaluation, purchasing decisions, inventory planning, production continuity, logistics coordination, and organizational responses to disruptions.

Including participants from different managerial functions supported a broader understanding of SCRM. Procurement managers provided evidence concerning supplier availability, material shortages, and sourcing decisions, whereas production managers described operational consequences such as downtime and schedule changes. Supply chain and operations managers contributed insights into logistics, coordination, information flows, and cross-functional responses. Senior managers provided strategic perspectives on business continuity, cost trade-offs, and long-term mitigation priorities.

Data Collection

Primary data were collected through semi-structured interviews. This method was selected because it ensured consistency across cases while allowing participants to explain their experiences in detail. The interview guide was organized around the study's research questions and addressed four principal areas: the identification and assessment of supply chain risks, the factors influencing mitigation decisions, the challenges experienced during implementation, and the practices used to strengthen supply chain resilience.

Participants were asked how their firms monitored suppliers, logistics, production schedules, inventory levels, and customer demand. They were also invited to explain how they assessed risk severity, selected mitigation strategies, and responded to previous disruptions. Additional questions examined supplier collaboration, transportation uncertainty, digital integration, budget constraints, strategic inventory, and cross-functional coordination.

Semi-structured interviewing was appropriate because SCRM involves processual and emergent actions that may not be fully anticipated before data collection. The method enabled the researcher

to explore how firms sensed, interpreted, and responded to disruptions and how trust, information sharing, coordination, and managerial judgment developed in practice. It also supported investigation of organizational routines, culture, and leadership decisions that quantitative research may overlook.

Where available, interview evidence was supplemented with relevant organizational documents, such as procurement policies, operating procedures, supplier-evaluation records, production reports, and business continuity documents. The use of multiple evidence sources supported triangulation and enabled interview statements to be examined alongside operational records.

Data Analysis

The data were analyzed using thematic analysis. Thematic analysis is a flexible but rigorous qualitative method for identifying, coding, organizing, and interpreting recurring patterns across interview transcripts and documents (Rauniyar et al., 2022). It is suitable for inductive knowledge development because it allows themes to emerge from participants' experiences while remaining aligned with the research questions.

The analysis began with familiarization through repeated reading of the interview transcripts. During this stage, preliminary observations were recorded regarding risk sources, decision factors, implementation barriers, and mitigation practices. The second stage involved open coding, in which relevant segments were assigned concise descriptive codes such as supplier reliability, business continuity, demand uncertainty, logistics disruption, financial constraint, supplier transparency, digital capability, and collaborative planning.

The third stage involved axial coding, through which related open codes were grouped into broader categories. For example, supplier reliability, trust, and long-term relationships were grouped under supplier management, while budget limitations and inventory costs were categorized as financial barriers. Shipping delays and port congestion were grouped as logistics barriers, whereas poor information sharing and weak digital integration were classified as communication and technological barriers.

The fourth stage involved developing and refining higher-order themes. These themes included determinants of mitigation decisions, implementation challenges, preferred mitigation strategies, and cross-case differences. Thematic analysis has been used in qualitative SCM research to identify risk sources, mitigation practices, and resilience enablers such as visibility, collaboration, data sharing, and digitalization.

Analysis was first conducted within each case to preserve organizational context. It was then extended across cases to identify similarities, differences, and recurring patterns. This sequence enabled the study to develop case-specific interpretations before constructing a broader explanation of SCRM practices across manufacturing subsectors (Rauniyar et al., 2022).

Research Trustworthiness

Trustworthiness was addressed through credibility, transferability, dependability, and confirmability. Credibility was strengthened through triangulation across participants, cases, managerial functions, and available organizational documents. Member checking and peer discussion may also be used to assess whether the interpretations accurately represent participants' experiences (Rauniyar et al., 2022).

Transferability was supported by providing detailed descriptions of the research setting, manufacturing subsectors, participants' organizational roles, and the supply chain conditions faced by the firms. Such contextual detail enables readers to determine whether the findings may be relevant to other manufacturing environments.

Dependability was enhanced through the consistent use of an interview protocol and systematic documentation of data collection, coding, theme development, and cross-case analysis. An audit trail linking interview evidence, codes, categories, and final themes supported the traceability of analytical decisions.

Confirmability was addressed by grounding interpretations in participants' statements and maintaining transparency regarding the coding process. Reflexive notes and representative interview excerpts helped distinguish participants' perspectives from researcher assumptions. Together, triangulation, contextual description, procedural consistency, reflexivity, and a transparent chain of evidence strengthened the rigor of the qualitative multiple-case study (Khan et al., 2023; Rauniyar et al., 2022).

RESULT AND DISCUSSION

Overview of the Findings

The thematic analysis identified three interrelated dimensions of supply chain risk mitigation among the manufacturing firms examined in Makassar. The first concerned the organizational and environmental factors influencing mitigation decisions, particularly supplier reliability, business continuity, demand uncertainty, regulatory conditions, fuel prices, and shipping availability. The second concerned the barriers that constrained the implementation of mitigation strategies, including financial limitations, inter-island transportation uncertainty, limited supplier transparency, and weak digital integration. The third concerned the strategies firms used to respond to these pressures, notably supplier diversification, collaborative planning, long-term supplier partnerships, strategic inventory, and cross-functional coordination.

Across the cases, supplier reliability and business continuity emerged as the most influential considerations. However, their practical effects differed according to sectoral conditions, resource availability, and exposure to logistics disruptions. Firms did not select mitigation strategies solely on the basis of cost. Instead, managers weighed the potential consequences of supply interruption, production downtime, delayed customer deliveries, and reputational damage. These findings indicate that risk mitigation decisions were shaped by a continuing trade-off between operational efficiency and continuity protection.

Supplier Reliability as a Determinant of Mitigation Decisions

Supplier reliability was consistently identified as a central consideration in mitigation strategy selection. Participants assessed reliability through delivery punctuality, material quality, responsiveness, communication, and the supplier's capacity to maintain deliveries during periods of uncertainty. The Supply Chain Manager explained that:

“Supplier reliability is the most influential factor. We prefer long-term suppliers because trust reduces uncertainty during unexpected situations.”

This statement shows that supplier reliability was understood not only as compliance with contractual delivery requirements but also as the capacity to provide flexibility and support during disruptions. Long-term relationships created expectations of responsiveness, priority treatment, and timely communication. Reliability therefore influenced whether firms maintained existing suppliers, developed additional sources, increased inventory, or strengthened collaborative planning.

The Manufacturing Manager similarly emphasized the value of early communication:

“Close communication enables suppliers to notify us about potential delays before problems become critical.”

This finding suggests that supplier reliability included informational reliability. Suppliers that communicated shortages or delays in advance allowed firms to revise production schedules, adjust procurement plans, or seek alternative materials before operations were interrupted. Reliability was therefore associated with both physical supply performance and the quality of information exchanged across organizational boundaries.

The findings correspond with literature that positions supplier reliability as a foundational component of supply chain resilience. Reliable supplier performance strengthens the effectiveness of collaboration, diversification, redundancy, and resource-sharing arrangements because the benefits of these strategies depend on the supplier's dependability and responsiveness (Zavala-Alcívar et al., 2020) (Zavala-Alcívar et al., 2020). Supplier vulnerability frameworks similarly demonstrate that reliability affects resilience outcomes and shapes the value of mitigation mechanisms across supply networks (Lawrence et al., 2020).

However, supplier reliability was not treated as sufficient by itself. Participants acknowledged that even dependable suppliers could be affected by port congestion, weather disruptions, shipping delays, shortages, or price volatility. Consequently, firms combined relationship-based practices with structural measures such as alternative sourcing and strategic inventory. The Manufacturing Manager stated:

“We diversify suppliers to reduce dependency on a single source. Alternative suppliers are always evaluated before emergencies occur.”

The evidence indicates that supplier diversification was used as a precaution against both supplier-specific failure and wider network disruption. Alternative suppliers were assessed in advance so that switching could occur more rapidly when the principal source was unable to deliver. This

pattern supports the view that uncertain supplier reliability increases the attractiveness of redundancy, diversified sourcing, buffer inventory, and continuity planning, whereas stronger reliability enables firms to place greater emphasis on collaboration, information sharing, and digitally enabled coordination (Fernando et al., 2023; Kashem et al., 2024; Zuniga, 2022).

The interview evidence also highlighted the role of trust in improving supplier responsiveness. The Procurement Manager observed:

“Long-term partnerships encourage suppliers to prioritize our orders during raw material shortages.”

Supplier relationships therefore functioned as informal risk-mitigation mechanisms. Although formal contracts defined purchasing obligations, relational trust provided additional flexibility when materials became scarce. This finding is particularly relevant in settings where supply markets are heterogeneous and formal monitoring systems remain uneven. In ASEAN and other emerging-economy contexts, supplier reliability is likewise identified as a significant criterion in the design of mitigation portfolios, especially where digital visibility and data-sharing capabilities vary across firms (Fernando et al., 2023; Holgado & Niess, 2023; Jomthanachai et al., 2022).

Business Continuity as a Strategic Priority

Business continuity emerged as the second major determinant of mitigation decisions (Bajgoric, 2014). Participants frequently described operational continuity as more important than achieving the lowest possible purchasing cost. The Manufacturing Director stated:

“Cost considerations remain important, but business continuity is prioritized. Sometimes we accept higher purchasing costs to reduce operational risks.”

This statement illustrates a deliberate managerial trade-off. Higher procurement expenditure was considered acceptable when it reduced the probability of production interruption, delivery failure, or customer dissatisfaction. Mitigation decisions were therefore evaluated according to their ability to sustain operations rather than solely through short-term cost efficiency.

Production downtime was treated as one of the most severe consequences of supply chain risk. The Production Manager explained:

“Production downtime is our main concern. Risks that stop production even for one day receive immediate attention.”

This finding indicates that continuity considerations directly influenced risk prioritization. Risks capable of halting production were escalated rapidly, even when their probability was lower than more frequent but less severe disruptions. Business continuity thus served both as a strategic objective and as a practical criterion for assessing risk severity.

The literature similarly conceptualizes business continuity as a principal goal of SCRM and supply chain resilience. Continuity considerations guide investments in redundancy, flexibility, visibility, collaboration, and adaptive capacity because these measures reduce interruption duration and

protect service levels during disruptions (Holgado & Niess, 2023; Zavala-Alcívar et al., 2020; Zhu et al., 2023). Post-pandemic studies also emphasize end-to-end visibility, rapid information exchange, flexible production, and diversified sourcing as mechanisms for sustaining operations under volatile conditions (Hald & Coslugeanu, 2021).

Strategic inventory represented one continuity-oriented response. The Procurement Manager stated:

“Maintaining strategic inventory for essential materials helps us continue production during temporary supply disruptions.”

Rather than maintaining uniformly high inventory levels, firms concentrated buffers on materials regarded as operationally critical. This approach reflected an attempt to balance continuity protection with inventory costs. The practice was especially relevant for imported materials or inputs dependent on inter-island transportation. However, the Manufacturing Manager noted that:

“Budget limitations often prevent us from maintaining large safety stocks. Inventory costs remain a major concern.”

The two statements reveal an important tension. Managers recognized the continuity value of safety stock, but financial constraints limited the scale at which it could be implemented. Consequently, firms adopted selective buffering rather than extensive redundancy. This pattern reflects the broader trade-off identified in the literature between resilience and efficiency. When continuity risks are high, firms tend to adopt dual sourcing, strategic stock, flexible capacity, and alternative logistics arrangements. When risks are more manageable, firms may combine leaner operations with improved visibility and collaborative governance (Hald & Coslugeanu, 2021; Kashem et al., 2024; Zavala-Alcívar et al., 2020).

Demand and External Environmental Influences

Although supplier reliability and continuity were dominant, mitigation decisions were also influenced by customer demand and external environmental conditions. The Procurement Manager explained:

“Customer demand fluctuations strongly influence procurement decisions. When demand becomes unpredictable, we avoid excessive inventory.”

Demand uncertainty affected the amount and timing of procurement. Firms attempted to avoid holding excessive materials when sales forecasts were unstable because surplus inventory increased storage costs and tied up working capital. This created a further trade-off between preparedness for supply disruption and exposure to overstocking.

The Operations Manager identified broader contextual pressures:

“Government regulations, fuel prices, and shipping availability significantly affect our mitigation strategies.”

These factors were particularly important in Makassar because manufacturing operations depended heavily on maritime logistics and inter-island distribution. Changes in fuel prices increased transportation expenditure, while variable shipping schedules affected lead times and material availability. Regulatory changes could also alter procurement, transportation, or production requirements. External conditions therefore shaped both the feasibility and cost of mitigation strategies.

The regional relevance of these findings is supported by studies of emerging economies and ASEAN supply networks, which emphasize infrastructure variability, trade dependence, regional coordination, and digital maturity as important influences on resilience and business continuity (Fernando et al., 2023; Jomthanachai et al., 2022; Motevali-Haghighi & Torabi, 2020). Such conditions make context-sensitive strategy selection essential because mitigation practices effective in mature industrial environments may not be directly transferable to firms operating under uncertain logistics and uneven technological capability.

Implementation Challenges

The first major implementation challenge was financial constraint. Safety stock, supplier diversification, digital technology, and alternative logistics arrangements required resources that were not always available. As a result, managers were often aware of desirable mitigation strategies but unable to implement them fully.

The second challenge was inter-island transportation uncertainty. The Supply Chain Manager stated:

“Transportation uncertainty between islands remains difficult to control because shipping schedules frequently change.”

This uncertainty reduced the accuracy of procurement and production planning. Even where suppliers fulfilled their obligations, delayed vessels or changing port schedules could interrupt material flows. Port congestion was especially difficult to predict, and logistics disruption could interact with machine breakdown or material shortages to create compound operational risks.

The third challenge was limited supplier transparency. The Procurement Manager reported:

“Some suppliers are unwilling to share production information, making risk anticipation difficult.”

Incomplete information prevented firms from detecting shortages early and weakened collaborative planning. Supplier reliability was therefore undermined when communication was delayed or selective. The fourth challenge was technological:

“Limited digital integration between suppliers and manufacturers delays information sharing.”

Weak digital connectivity reduced real-time visibility and slowed organizational responses. Although the literature identifies digital technologies, data analytics, and information platforms as important continuity enablers, the findings show that their effectiveness depends on adoption

across supply chain partners rather than within a single firm alone (Fernando et al., 2023; Iftikhar et al., 2023; Kashem et al., 2024).

Integrated Mitigation Responses

The participating firms responded to these pressures through a combination of structural, relational, informational, and organizational strategies. Structural responses included multiple sourcing and strategic inventory. Relational responses included long-term partnerships, trust-building, and collaborative planning. Informational responses involved monitoring suppliers, shipping schedules, inventory levels, and production records. Organizational responses included coordination across procurement, production, logistics, and finance.

The Operations Manager emphasized the importance of internal integration:

“Cross-functional coordination among procurement, production, and logistics teams significantly improves organizational responsiveness.”

The Supply Chain Manager similarly noted:

“Collaborative planning improves forecasting accuracy and allows suppliers to prepare production capacity earlier.”

These findings demonstrate that mitigation effectiveness did not depend on an isolated strategy. Instead, firms combined supplier reliability assessments, continuity priorities, internal coordination, and external collaboration. The evidence therefore supports an integrated view in which supplier reliability shapes the preferred mix of strategies, while business continuity determines their urgency and acceptable cost. High supplier reliability encouraged collaborative and information-based responses, whereas uncertain reliability increased reliance on diversification, strategic inventory, and contingency planning.

Overall, the findings reveal a coherent but context-dependent pattern. Supplier reliability functioned as a foundational input to mitigation decisions, while business continuity served as their principal strategic objective. Nevertheless, financial, logistical, informational, and technological barriers constrained implementation. These tensions explain why firms in Makassar relied on portfolios of complementary strategies rather than a single universal mitigation mechanism.

The findings demonstrate that supply chain risk mitigation among manufacturing firms in Makassar is best understood as an ongoing, context-dependent organizational capability rather than a set of isolated responses to disruption. Participants described risk management as a continuous process involving supplier monitoring, operational assessment, mitigation planning, information exchange, and periodic adjustment. This pattern supports established Supply Chain Risk Management theory, which conceptualizes SCRM as a lifecycle of risk identification, assessment, mitigation, and monitoring embedded within interorganizational coordination (Kara et al., 2020; Zavala-Alcívar et al., 2020; Zuniga, 2022). The evidence also confirms that firms rarely depend on a single mitigation mechanism. Instead, they combine supplier diversification, strategic inventory, collaborative planning, long-term relationships, and cross-functional coordination

according to the perceived severity of risk and the resources available. This challenges universal or prescriptive interpretations of SCRM by showing that the effectiveness of a mitigation strategy depends on organizational constraints, supply network conditions, and the nature of the disruption.

Supplier reliability emerged as a foundational influence on mitigation decisions. The participating firms assessed suppliers not only through delivery punctuality and material quality but also through responsiveness, communication, and willingness to cooperate during unexpected events. This finding supports the view that supplier risk should be analyzed as part of a broader network of interdependencies rather than as an isolated transactional concern (Zavala-Alcívar et al., 2020). Reliable suppliers enabled firms to rely more extensively on collaborative planning, information sharing, and relationship-based flexibility. Conversely, uncertain supplier performance encouraged greater use of alternative sources, strategic stock, and formal contingency planning. This distinction is consistent with literature differentiating dedicated and shared resilience levers. Firms facing strategically important or difficult-to-replace inputs may favor supplier-specific redundancy and close collaboration, whereas those under stronger cost pressure may rely on wider supplier pools or shared resources. The findings therefore suggest that supplier reliability influences not merely whether firms mitigate risk, but also the combination and intensity of resilience measures they select.

The study further demonstrates that supplier collaboration contributes to resilience by improving early warning, planning accuracy, and operational responsiveness. Participants emphasized that close communication allowed suppliers to report potential delays before they developed into production interruptions. Long-term partnerships also increased the likelihood that suppliers would prioritize orders during shortages. These practices support previous research identifying joint planning, information sharing, coordinated responses, and relational governance as central resilience enablers (Kashem et al., 2024; Khan et al., 2023; Zavala-Alcívar et al., 2020). However, collaboration was effective only when supported by organizational capability. Firms needed internal routines to interpret supplier information, revise procurement decisions, coordinate production schedules, and mobilize alternative resources. Thus, supplier collaboration and organizational capability were mutually reinforcing rather than independent. Collaborative information had limited value when firms lacked the internal capacity to act on it, while organizational flexibility was constrained when suppliers did not provide timely and accurate information.

Business continuity was the principal objective guiding strategy selection. Managers were willing to accept higher purchasing or inventory costs when these expenditures reduced the risk of production stoppage and delayed customer delivery. This supports resilience theory, which frames continuity as an outcome of redundancy, flexibility, visibility, and collaboration rather than as a purely financial objective (Holgado & Niess, 2023; Zavala-Alcívar et al., 2020; Zhu et al., 2023). At the same time, the findings reveal a persistent tension between continuity and efficiency. Strategic inventory improved protection against temporary shortages, but budget and storage constraints prevented firms from maintaining large buffers. Supplier diversification reduced dependency, but identifying and qualifying alternative suppliers required additional time and resources. These trade-offs confirm that stronger resilience does not result from maximizing every

mitigation mechanism. Instead, firms must configure portfolios of measures that correspond to their risk exposure, financial capacity, and operational priorities. This contextual balancing of cost and continuity supports the argument that resilience design should account for both dedicated and shared resources rather than assume a single optimal structure.

The Makassar context significantly influenced mitigation effectiveness. Inter-island logistics dependence, fluctuating shipping schedules, port congestion, fuel price changes, and varying supplier capabilities created forms of uncertainty that differ from those typically examined in mature industrial economies. Even reliable suppliers could not prevent delays caused by transportation disruptions or limited shipping availability. This finding reinforces evidence that SCRM effectiveness is shaped by regional infrastructure, policy conditions, supplier diversity, digital maturity, and data-sharing practices (Fernando et al., 2023; Jomthanachai et al., 2022). In emerging economies, resilience therefore depends not only on firm-level action but also on broader logistics and institutional systems. The findings support calls for context-sensitive SCRM frameworks that avoid assuming that strategies developed in highly digitized and infrastructure-rich environments can be transferred directly to Southeast Asian manufacturing settings (Holgado & Niess, 2023).

Digital integration represented another important contextual constraint. The literature frequently positions artificial intelligence, the Internet of Things, blockchain, and data analytics as essential enablers of end-to-end visibility and proactive risk management (Fernando et al., 2023; Hald & Coslugeanu, 2021; Hsu et al., 2022; Iftikhar et al., 2023). However, participants reported that limited integration between manufacturers and suppliers delayed information sharing. This finding qualifies technology-centered explanations of resilience by showing that digital tools are only effective when they are jointly adopted and supported by compatible routines, data standards, and governance arrangements. Investment by one firm cannot produce network visibility when suppliers lack comparable systems or are unwilling to disclose operational information. Digital resilience should therefore be understood as an interorganizational capability rather than an internal technological asset.

The study contributes theoretically by reinforcing the interpretation of resilience as a dynamic capability that mediates the relationship between disruption risk and organizational performance (Zavala-Alcívar et al., 2020). The findings indicate that this capability is produced through the interaction of relational, operational, informational, and structural levers. Supplier trust and collaboration represent relational capabilities; cross-functional coordination and flexible planning represent organizational capabilities; monitoring and digital visibility constitute informational capabilities; and diversification and inventory buffers represent structural capabilities. Their effectiveness is moderated by cost pressure, sectoral requirements, logistics infrastructure, and supplier maturity. This integrated explanation extends SCRM theory by showing how resilience develops through combinations of capabilities under emerging-economy constraints rather than through isolated best practices.

Managerially, the findings suggest that manufacturing firms should evaluate suppliers using broader criteria than price and delivery history. Reliability assessments should include communication quality, responsiveness during disruption, production transparency, and

willingness to participate in contingency planning. Firms should also strengthen cross-functional decision-making so that procurement, production, logistics, and finance can respond collectively to risk signals. Selective strategic inventory, prequalified alternative suppliers, shared forecasting, and practical digital dashboards may provide more feasible resilience improvements than expensive system-wide transformation. For policymakers, the findings indicate the need to improve port reliability, inter-island transport coordination, digital infrastructure, and supplier capability development. Strengthening these external conditions would allow firm-level mitigation strategies to operate more effectively and would contribute to the resilience of manufacturing networks across Eastern Indonesia.

CONCLUSION

This study explored the determinants and implementation challenges of supply chain risk mitigation strategies among manufacturing firms in Makassar, Indonesia, using a qualitative multiple-case study approach. The findings demonstrate that supply chain risk mitigation is a continuous organizational capability that integrates risk identification, assessment, mitigation, and adaptation rather than a series of isolated responses to disruptions. Across the participating firms, supplier reliability and business continuity consistently emerged as the primary determinants influencing managerial decision-making. Managers evaluated suppliers not only on delivery performance and product quality but also on responsiveness, communication, and their ability to maintain supply during uncertain conditions. At the same time, business continuity was prioritized over short-term cost efficiency, leading firms to adopt mitigation strategies that protected production continuity and customer service even when additional operational costs were incurred.

The study also revealed that manufacturing firms face significant implementation challenges that limit the effectiveness of supply chain risk mitigation. Financial constraints restricted investments in strategic inventory, digital technologies, and supplier diversification. Inter-island logistics uncertainty, fluctuating transportation schedules, limited supplier transparency, and uneven digital integration further complicated risk management efforts. These findings indicate that successful mitigation depends not only on selecting appropriate strategies but also on the organizational and environmental conditions that enable those strategies to function effectively. Consequently, firms adopted combinations of complementary practices—including supplier diversification, long-term supplier partnerships, collaborative planning, strategic inventory, and cross-functional coordination—to improve resilience while balancing operational and financial constraints.

From a theoretical perspective, this research contributes to the Supply Chain Risk Management literature by extending qualitative understanding of how resilience is developed through the interaction of relational, organizational, informational, and structural capabilities. Rather than treating resilience as a single organizational attribute, the findings demonstrate that it emerges from the combined influence of supplier collaboration, managerial decision-making, information sharing, operational flexibility, and contextual factors specific to emerging economies. The study also provides empirical evidence supporting the view that resilience should be conceptualized as a dynamic capability whose effectiveness is moderated by regional logistics infrastructure, institutional conditions, digital maturity, and organizational resources. By providing qualitative

evidence from Indonesia, the research addresses an important gap in the predominantly quantitative SCRM literature and contributes to the development of context-sensitive theory for manufacturing firms operating in Southeast Asia.

The findings also generate important practical implications. Manufacturing managers should strengthen supplier evaluation processes by considering communication quality, responsiveness, transparency, and collaborative capability alongside traditional performance measures. Investments in long-term supplier relationships, cross-functional coordination, selective strategic inventory, and digital information-sharing systems can improve organizational responsiveness to disruptions while maintaining operational continuity. Furthermore, organizations should develop formal business continuity plans that integrate procurement, production, logistics, and inventory management to support faster decision-making during unexpected events.

The study additionally offers policy implications for governments, industrial associations, and logistics stakeholders. Improving transportation infrastructure, port efficiency, digital connectivity, and supply chain information sharing can significantly enhance the resilience of manufacturing supply networks in Eastern Indonesia. Policies that encourage supplier capability development, digital transformation, and regional collaboration may strengthen the capacity of manufacturing firms to respond to future disruptions while supporting national industrial competitiveness.

Several limitations should be acknowledged. The study focused on manufacturing firms located in Makassar and therefore reflects the characteristics of a specific regional context. The qualitative design prioritizes depth of understanding over statistical generalization, and the findings should be interpreted as analytically transferable rather than universally representative. In addition, the study relied primarily on managerial perspectives, which may not fully capture the views of suppliers, logistics providers, customers, or government agencies.

Future research should expand the investigation to additional manufacturing sectors and geographical regions within Indonesia and Southeast Asia to examine whether similar patterns emerge under different institutional and logistical conditions. Comparative cross-country studies, longitudinal case studies, and mixed-methods research could further examine how supply chain risk mitigation strategies evolve over time and how digital technologies, sustainability initiatives, and collaborative governance influence organizational resilience. Such research would deepen theoretical understanding while providing stronger evidence for developing resilient manufacturing supply chains capable of responding effectively to future global disruptions.

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