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Towards a Unified Conceptual Framework for Achieving Supply Chain Agility: Integrating Partner Selection, Enablers, and Strategic Partnership in Lean-Agile Landscapes

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Abstract:

Background: In an increasingly volatile business environment characterized by demand fluctuations, unpredictable markets, and rapid product life-cycle changes, supply chain agility has emerged as a critical strategic imperative. Prior research has explored supplier/partner selection, agility enablers, process control, lean-agile hybrids, and the impacts of technological or strategic enablers. However, these streams often remain fragmented, lacking a unified conceptual framework that bridges partner selection, enabler interactions, process control, and strategic partnership under lean-agile paradigms.

Purpose: This paper aims to synthesize the extant literature on agile supply chain to propose a comprehensive conceptual framework that integrates (1) criteria for supplier/partner selection, (2) structural and operational enablers of agility, (3) process control mechanisms, and (4) strategic supply chain partnership dynamics — thereby offering a holistic view of how organizations can achieve agility in lean-agile or hybrid supply chain contexts.

Methodology: Adopting a theory-building paradigm, the study performs an intensive literature synthesis of seminal and contemporary works on agile supply chain from multiple disciplines, including manufacturing, logistics, and digital transformation. Patterns, themes, and conceptual linkages are identified, mapped, and integrated into a unified model.

Findings: The resulting framework reveals that effective agile supply chain implementation depends on the sequential and iterative interplay between partner

selection based on agility compatibility, establishing enablers (organizational culture, information systems, process flexibility), embedding process control for responsiveness, and nurturing strategic partnerships supported by postponement and dynamic capabilities. The framework also accommodates lean-agile hybrids (leagile) to balance cost-efficiency with responsiveness, and includes digital transformation influences such as IoT/AI-driven warehouse management.

Implications: For practitioners, the framework offers a diagnostic and design tool to assess and build supply chain agility holistically. For academics, it provides a foundation for empirical validation and extension in different industry contexts.

Originality: By unifying disparate streams into an integrated conceptual architecture, this paper addresses a significant literature gap and advances theory by illustrating the interactions among critical agility determinants.

Keywords: supply chain agility, agile supply chain, lean-agile, supplier selection, strategic partnership, supply chain responsiveness, process control

INTRODUCTION

In the contemporary business environment, volatility, uncertainty, complexity, and ambiguity (VUCA) have become the norm, rather than the exception. Organizations face rapid shifts in demand, unpredictable market trends, shorter product life cycles, and intensifying global competition. In such an environment, conventional supply chain designs—optimized for efficiency and cost minimization—are often inadequate. Instead, firms require supply chains capable of swiftly sensing and responding to changes: agile supply chains.

Over the past two decades, a rich body of research has emerged around the concept of the agile supply chain. Pioneering work by scholars such as Power, Sohal & Rahman (2001) identified critical success factors for agility; subsequent studies explored enablers, supplier selection, hybrid lean-agile strategies, process control, and the influence of technology and strategic partnerships. Nonetheless, much of this scholarship remains fragmented. Studies often focus narrowly on one dimension—such as enablers of agility, or supplier selection—without integrating these components into a comprehensive framework.

This fragmentation poses a challenge for both researchers seeking to build cumulative theory and practitioners seeking actionable guidance. Without a unified model, organizations may overlook critical interactions between factors—e.g., how partner selection criteria align with enablers, or how strategic partnerships affect process control and responsiveness.

Therefore, this paper aims to bridge this gap by constructing a unified conceptual framework that synthesizes multiple streams of literature: supplier/partner selection, enablers of agility, process control, hybrid lean-agile strategies, and strategic partnerships — all within the modern context of digital transformation. By doing so, we provide a holistic architecture for understanding and implementing supply chain agility.

The remainder of the paper is organized as follows. The next section outlines the methodology, including the literature synthesis process. Then, the core conceptual framework is presented, with detailed explanation of its components and interrelations. This is followed by a deeper discussion of theoretical implications, practical recommendations, limitations, and directions for future empirical research.

METHODOLOGY

Given the objective to build a comprehensive conceptual framework rather than test empirical hypotheses, this paper adopts a theory-building approach rooted in integrative literature synthesis.

Literature Identification and Selection

The starting point was a curated list of seminal and recent peer-reviewed works known for advancing agile supply chain thinking — including but not limited to supplier selection (Matawale, Datta & Mahapatra, 2016), enablers of agility (Navid & Ismaeli, 2012; Pandey & Garg, 2009), process control (Pearson, Masson & Swain, 2010), hybrid lean-agile strategy (Rahiminezhad Galankashi & Helmi, 2016), and strategic supply chain partnership and postponement (Qrunfleh & Tarafdar, 2013). To broaden the perspective and align with contemporary digital supply chains, works examining agility in software development (Meiliana et al., 2023; Mishra & Alzoubi, 2023; Michalides et al., 2023) and logistics transformations (Chowdhury, 2025; Narayanan & Antoniou, 2022; Njoya et al., 2023) were also included. Although some of these come from domains outside traditional supply chain, they contribute valuable conceptual parallels and emerging practice trends.

Analytic Strategy

The synthesis proceeded in iterative cycles: first, thematic extraction — identifying key concepts, constructs, and relationships from each source; second, mapping overlaps and distinctions across studies; third,

abstracting higher-order categories that could subsume similar constructs; fourth, specifying linkages and creating a conceptual model.

During thematic extraction, each paper's main findings, model elements, identified success factors, and recommendations were catalogued. In mapping, similar constructs — such as "information sharing," "process flexibility," "supplier responsiveness," "postponement," "strategic partnership" — were grouped, and synonyms or related phrases harmonized into consistent labels. Finally, using abductive reasoning, the framework was built to reflect logical and empirical patterns found across studies, while maintaining conceptual parsimony and coherence.

This method aligns with accepted practices for theory development in supply chain management, where conceptual frameworks often emerge from integrative syntheses (particularly when empirical data is absent or varied).

Conceptual Framework and Results

In this section, we present the conceptual framework derived from the literature synthesis. The framework posits that achieving supply chain agility — defined as the ability to rapidly sense and respond to market changes, maintain service levels, and manage uncertainty — depends on four interrelated pillars: (1) Supplier/Partner Selection, (2) Structural & Operational Enablers, (3) Process Control & Responsiveness Mechanisms, and (4) Strategic Partnership & Hybrid Strategy Alignment. We discuss each pillar in turn, followed by a description of their interplay and sequential dynamics.

Supplier/Partner Selection

At the foundation of supply chain agility lies the selection of appropriate suppliers or partners. If partners lack alignment with agility requirements, downstream efforts may be undermined. The work by Matawale, Datta & Mahapatra (2016) underscores this: they demonstrate how vague set theory can support decision-making under uncertainty when selecting suppliers in agile supply chains. Their methodology captures imprecision in human judgment and helps managers evaluate suppliers on multiple ambiguous criteria (e.g., flexibility, responsiveness, reliability) under uncertain information — a context typical of volatile markets.

Thus, we posit that Supplier/Partner Agility Compatibility is a critical initial filter. This dimension comprises criteria such as flexibility to adjust volumes or delivery schedules, responsiveness to changing requirements, reliability under uncertainty, openness to information sharing, and cultural/organizational compatibility with agility values (e.g., communication, collaboration, transparency).

Selecting partners with high agility compatibility ensures that subsequent efforts — such as enabling structures or process control — are built on a stable, synchronized foundation. Failure at this stage can erode agility regardless of how effective other mechanisms may be.

Structural & Operational Enablers

Once agile-compatible partners are in place, the next pillar consists of structural and operational enablers that facilitate agile behavior throughout the supply chain. Prior literature identifies a variety of these enablers: information sharing and technology, organizational culture and trust, process flexibility and modularity, real-time data visibility, and rapid decision-making capabilities.

Navid & Ismaeli (2012) analyze effective elements in agile supply chain and highlight enablers such as information technology integration, cross-functional teams, high communication levels, and flexible procurement processes. Pandey & Garg (2009) similarly examine enablers and interactions among them — noting that agility depends not on isolated enablers but on complex interactions and mutual reinforcement.

Across these studies, three higher-order enabler categories emerge:

- Information and Communication Infrastructure: including real-time data sharing, integrated IT systems, collaborative platforms, transparency of demand and supply data.
- Organizational Culture and Collaboration: trust-based relationships, collaborative mindset across firms, willingness to share risks and information, dynamic decision-making.
- Process Flexibility and Modular Operational Design: modular product architectures, flexible manufacturing or procurement processes, ability to adjust order quantities, shorten lead times, and reconfigure operations rapidly.

These enablers create the capacity for agility, but only in conjunction with one another. For instance, flexible processes without information sharing may still be reactive and inefficient; information systems without collaborative culture may be underutilized; collaborative culture without process flexibility may lead to inertia.

Process Control & Responsiveness Mechanisms

Even with partners selected and enablers in place, achieving agility requires concrete mechanisms for

process control and responsiveness. This third pillar draws heavily on the work of Pearson, Masson & Swain (2010), who discuss how process control in an agile supply network can enhance responsiveness and stability. Their findings suggest that process control mechanisms such as real-time monitoring, dynamic scheduling, buffer strategies, and feedback loops help manage variability and unpredictable demand without sacrificing performance.

Moreover, responsiveness is not simply reactive; it must be proactive and anticipative. In this vein, structural enablers (like real-time data and modular processes) feed into process control mechanisms to allow quick detection of change and rapid adjustment. For example, when a sudden spike in demand is anticipated, the supply chain can use buffer strategies, dynamic order batching, and rapid reallocation of resources to respond.

Thus, Process Control & Responsiveness is conceptualized as the dynamic heart of agility — converting potential (from enablers) into action when the environment demands it.

Strategic Partnership & Hybrid Strategy Alignment (Lean-Agile "Leagile")

The fourth pillar of the framework acknowledges that agility cannot be pursued in isolation from cost-efficiency concerns. Many firms operate under tight cost constraints, making purely agile supply chains economically unviable. This has led to the proliferation of hybrid strategies — often referred to as "leagile" — combining the responsiveness of agility with the cost advantages of lean. The work by Rahiminezhad Galankashi & Helmi (2016) assesses such hybrid lean-agile strategies and illustrates how firms can balance lean efficiency with agile responsiveness.

Complementing this, strategic supply chain partnerships and postponement strategies play a crucial role. Qrunfleh & Tarafdar (2013) examine how strategic supply chain partnership and postponement affect supply chain responsiveness under lean and agile strategies. Their results suggest that strong partnerships — characterized by trust, long-term collaboration, shared information, and risk-sharing — enhance responsiveness even when lean elements are present. Postponement (delaying final product configuration or assembly until demand becomes clearer) is particularly effective in volatile environments, reducing inventory costs while allowing for flexibility.

Incorporating these insights, our framework presents Strategic Partnership & Leagile Alignment as the mechanism by which organizations balance efficiency and responsiveness. This pillar ensures that supply chain design aligns with both cost constraints and market uncertainty, using partnerships and postponement to manage trade-offs.

Interplay and Sequential Dynamics

While the four pillars have been described individually, their effectiveness depends on their interplay. The conceptual framework posits a sequential yet iterative progression: first, supplier/partner selection; second, establishment of enabling infrastructure and culture; third, embedding process control and responsiveness mechanisms; fourth, aligning strategic partnerships and hybrid strategies. However, the process is not strictly linear; feedback loops exist. For instance, experiences from process control can inform re-evaluation of partner selection; strategic partnerships may lead to deeper investment in enablers; or technological advances (e.g., digital transformation) may revise how process control is implemented.

Ultimately, supply chain agility emerges from the dynamic integration of all four pillars — not from any single component. Organizations that neglect one pillar (e.g., choose cheap suppliers over agile-compatible ones, or implement IT systems without collaborative culture) risk undermining overall agility.

DISCUSSION

Having articulated the conceptual framework, this section interprets its theoretical contributions, practical implications, limitations, and potential directions for future research.

Theoretical Contributions

First, the framework advances theory by unifying previously siloed research streams. Prior studies have individually addressed partner selection (Matawale et al., 2016), enablers (Navid & Ismaeli, 2012; Pandey & Garg, 2009), process control (Pearson et al., 2010), and hybrid lean-agile strategies (Rahiminezhad Galankashi & Helmi, 2016; Qrunfleh & Tarafdar, 2013). By integrating these into a singular architecture, the framework provides a meta-theory of supply chain agility.

Second, by including hybrid lean-agile strategy and strategic partnerships, the framework acknowledges the tension between cost-efficiency and responsiveness — a tension often ignored by purely agility-focused studies. This makes the model more realistic and applicable to a broader range of firms, including those operating under cost pressure.

Third, the framework bridges traditional supply chain literature and emerging trends from digital transformation, software-like agility approaches, and modern logistics innovations. The inclusion of insights from agility in software development (Meiliana et al.,

2023; Mishra & Alzoubi, 2023; Michalides et al., 2023) and recent logistics studies (Chowdhury, 2025; Narayanan & Antoniou, 2022; Njoya et al., 2023) enriches the framework's relevance in a digitally evolving supply chain ecosystem. This cross-domain synthesis encourages interdisciplinary thinking and opens the door for further cross-fertilization of agile concepts.

Practical Implications

For practitioners — supply chain managers, procurement heads, operations directors — the framework offers a diagnostic and design tool. Depending on their current maturity level, organizations can assess which pillars are weak or underdeveloped. For instance:

●A firm experiencing frequent supply disruptions despite investment in IT might discover that partner selection lacked emphasis on agility compatibility.

●Another firm struggling to respond to demand spikes might identify inadequate process control mechanisms despite robust enablers.

●Firms evaluating cost-cutting strategies can use the framework to design lean-agile hybrids, balancing cost and flexibility by leveraging postponement and strategic partnerships.

Moreover, the framework encourages investment not just in technology, but also in organizational culture, collaboration, trust, and long-term partnership — elements often undervalued in supply chain redesign.

In the context of digital transformation, the framework provides guidance on integrating new technologies (e.g., IoT, AI, real-time tracking) into enabler architecture and process control — without losing sight of partner selection and strategic alignment. Indeed, this holistic perspective is especially critical as supply chains become more digital, global, and interconnected.

Limitations

Despite its contributions, the framework has several limitations.

First, as a conceptual model built from literature synthesis, it lacks empirical validation. While the included studies provide evidence for individual components and relationships, the integrated model — particularly the interactions among pillars — requires rigorous empirical testing across industries and contexts. Without such testing, the model remains a theoretical proposition.

Second, the selection of literature, though broad, may not be exhaustive. The curated reference list reflects known influential studies, but there may be relevant research outside of the included works that could refine or challenge the framework. For instance, empirical studies from specific industries (e.g., high-tech manufacturing, perishable goods, e-commerce) with differing agility requirements may exhibit additional or different factors.

Third, the framework assumes that organizations have at least minimal resources and managerial commitment. In resource-constrained firms, implementing all four pillars may be impractical. Moreover, the model does not provide guidance on prioritization or staging — for example, which pillar to implement first if resources are limited, or how to sequence investments for maximum return.

Fourth, the influence of external factors — such as regulatory environment, macroeconomic instability, geopolitical disruptions, or supply base concentration — is not explicitly modeled. These factors may significantly impact supply chain agility, but are assumed exogenous.

Future Research Directions

To advance the field, future research should pursue the following:

●Empirical Validation: Conduct multi-industry, multi-country case studies or large-sample surveys to test the hypothesized relationships among pillars, measure their relative influence on agility outcomes, and assess moderating factors (e.g., industry type, product complexity, firm size).

●Staging and Maturity Roadmaps: Develop maturity models that use the framework to guide firms in incremental adoption of agility practices, prioritizing pillars based on resource availability or strategic priorities.

●Integration of External Contingencies: Extend the framework to include external environmental factors — such as regulatory constraints, supply base diversity, geopolitical risk — to assess how they moderate the efficacy of agility practices.

●Deeper Digital Transformation Dimension: Given rapid advances in IoT, AI-driven warehouse tracking, real-time demand sensing, autonomous logistics, etc., research should examine how emerging digital technologies can serve as enablers, reshape process control mechanisms, and affect strategic partnerships. For instance, the study by Chowdhury (2025) on Agile, IoT, and AI in warehouse tracking suggests a growing role of technology in agility. Similarly, logistics innovations such as electric cargo cycles (Narayanan & Antoniou, 2022) and evolving air cargo dynamics (Njoya et al., 2023) point toward a broader ecosystem transformation.

●Cross-Domain Comparative Analysis: Scholars might explore parallels between agility in supply chain and in

software development or product design, deriving cross-domain best practices; for example, the flexible sprint-based planning from software agile (Meiliana et al., 2023) may inform modular supply chain design.

CONCLUSION

In an era of heightened uncertainty, rapid change, and increasing global complexity, supply chain agility is not a luxury but a necessity. Yet, achieving agility is not a matter of adopting a single practice; it requires a holistic, integrated approach encompassing partner selection, enabling structures, responsive process control, and strategic alignment — possibly within lean-agile hybrids to manage cost and responsiveness trade-offs.

This paper has synthesized fragmented literatures into a unified conceptual framework that elucidates how these components interrelate and dynamically interact to produce supply chain agility. By doing so, it fills a significant theoretical gap and offers a practical roadmap for managers.

However, the framework remains a theoretical proposition and calls for empirical validation. Future research, guided by the directions outlined, can test, refine, and extend this model — potentially leading to the development of maturity models, industry-specific adaptations, and digital-era agility practices.

In sum, this integrative effort advances both academic understanding and managerial practice, offering a comprehensive lens for understanding and achieving agility in modern supply chains.

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