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Redefining the Organizational Scaffolding for Digital Supply Chain Transformation: A Model for Internal Value Co-creation

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Abstract: Digital transformation in manufacturing frequently fails due to organizational friction and misaligned structures, not technological limitations; while firms invest heavily in digital supply chain platforms, the organizational scaffolding—the formal and informal structures that enable cross-functional collaboration—often remains unchanged, constraining the value creation potential of digital investments. This conceptual paper therefore develops a framework for Internal Value Co-creation (IVCC) that explains how organizational design, cross-functional integration, and digital platforms interact to enable firms to realize the full value of digital supply chain transformation. Synthesizing insights from organizational design theory, value co-creation literature, and socio-technical systems theory, we develop a set of theoretically grounded propositions that specify how organizational scaffolding enables or constrains digital value creation.

1. Introduction

Over the past decade, manufacturing firms globally have invested billions in digital technologies—ERP, WMS, MES, and analytics platforms—promising real-time visibility, predictive intelligence, and automated decision-making. In China, initiatives like "Made in China 2025" accelerated this, with over sixty percent of manufacturers reporting significant investments (State Taxation Administration, 2026). Yet a paradox has emerged: many firms acquired sophisticated platforms without commensurate gains in performance, resilience, or competitiveness. Dashboards chronicle failures rather than prevent them; predictive alerts are ignored or acted upon too slowly; integrated platforms reveal organizational silos that constrain action. This gap has led scholars and practitioners to question whether the challenge lies not in technology but in the organizational structures, processes, and capabilities that must evolve alongside it (Kane et al., 2019).

The gap between digital investment and realized value stems from a fundamental oversight: firms have invested in digital assets but neglected the organizational scaffolding—roles, decision rights, metrics, coordination mechanisms, and culture—that enables these assets to generate value. Digital platforms generate information; information creates value only when interpreted, shared, and acted upon across boundaries. When scaffolding is misaligned, organizational friction emerges: functional

silos block information flow, misaligned metrics create perverse incentives, unclear decision rights cause delays, and resistance to change leads to underutilization. These frictions erode value creation, explaining why firms with sophisticated platforms can underperform less digitized but better-organized competitors.

The framework is grounded in automotive electronics manufacturing in China—a sector epitomizing digital transformation challenges in a complex, volatile, cost-sensitive environment. Driven by domestic market growth, government push toward intelligent connected vehicles, and world-class OEMs like BYD, Geely, Great Wall, Changan, and GAC, Tier-1 suppliers of intelligent cockpit systems, ADAS, and positioning modules face extreme product complexity, relentless OEM demand volatility, and intense cost competition. They manage multi-country supply chains, hundreds of components, and dozens of vehicle models with unique specifications. This complexity demands seamless cross-functional coordination—yet traditional silos, conflicting metrics, and communication barriers create precisely the friction digital platforms should alleviate but cannot without appropriate scaffolding. This context provides a theoretically rich setting for examining how scaffolding enables platforms to generate value through cross-functional collaboration and Internal Value Co-creation.

2. Literature Review

2.1. Digital Supply Chain Transformation: Technology and Beyond

Digital supply chain transformation is a strategic imperative for manufacturing firms, promising improvements in efficiency, responsiveness, and resilience. It encompasses integrating digital technologies across procurement, production, logistics, and delivery to create new value and competitive advantage. Scholars distinguish digitization—converting analogue information to digital—from digitalization—using digital technologies to transform processes, structures, and value models. This distinction explains why many firms invest in technology without commensurate gains: they digitize without digitalizing, acquiring assets without the organizational capabilities to extract value. Properly understood, transformation includes technology adoption plus process redesign, capability development, organizational change, and strategic repositioning [1].

The organizational dimension has received less attention than the technological, representing a significant gap. While technology literature examines adoption and performance effects, it neglects organizational conditions enabling or constraining value creation. Scholars have called for attention to barriers including functional silos, misaligned metrics, unclear decision rights, and cultural resistance—forms of friction that erode value creation potential, explaining why sophisticated platforms can underperform better-organized competitors. This neglect reflects a tendency to treat technology and organization as independent rather than interdependent components of a socio-technical system requiring joint optimization. This paper addresses this gap by developing a framework articulating how organizational scaffolding—formal and informal structures enabling collaboration and value creation—enables digital platforms to generate value through Internal Value Co-creation [2].

2.2. Organizational Design Theory: Structures, Processes, and Coordination

Organizational design theory provides a foundational lens for understanding how firms structure themselves to achieve objectives, coordinate specialized units, and adapt to changing conditions. Classical organization theory, rooted in Weber, Fayol, and Taylor, established principles of bureaucratic organization—specialization, formalization, hierarchy, standardization—that dominated much of the twentieth century. Contingency theory later challenged this, arguing there is no single best way to organize; optimal form depends on environmental uncertainty, technology, strategy, and

size. The information processing view extended this, framing organizations as information processing systems that must match processing capacity to environmental demands. When uncertainty increases, organizations must either increase processing capacity through information systems, structures, and coordination mechanisms, or reduce the need for processing through buffering, slack, and task reduction. This perspective is particularly relevant to supply chain management, where demand volatility, disruptions, and geopolitical factors create substantial processing demands requiring appropriate design choices [3].

The digital age has altered possibilities and requirements for organizational design. Digital technologies enable flatter hierarchies by providing direct information access previously requiring hierarchical mediation. Empowered teams can decide based on real-time data without waiting for approval, accelerating response. Cross-functional collaboration is facilitated by shared platforms providing common visibility and joint problem-solving. The rise of the process owner—an individual with end-to-end accountability—reflects digital integration's organizational implications: when platforms provide cross-functional visibility, organizations can hold individuals accountable for cross-functional performance as never before. However, digitalization introduces challenges. Transparency can threaten power structures and generate resistance. Digital decision speed can outpace governance, creating coordination gaps. Information volume and complexity can overwhelm decision-makers, creating overload rather than insight. These challenges underscore the importance of organizational scaffolding—formal and informal structures enabling effective use of digital capabilities—in realizing transformation value [4].

2.3. Cross-functional Integration in Supply Chains

Cross-functional integration is a critical capability for supply chain performance, enabling organizations to coordinate across specialized functions and respond to complex, dynamic environments. It encompasses the extent to which functions—procurement, production, logistics, sales, finance—share information, coordinate decisions, and collaborate on problem-solving. Scholars distinguish internal integration (within the firm) from external integration (with suppliers, customers, logistics providers). Both are essential, but internal integration is foundational because it enables the capabilities required for effective external integration: organizations that cannot coordinate internally are unlikely to coordinate with partners. Evidence from Chinese manufacturers shows internal integration significantly influences both customer and supplier integration, suggesting firms should pursue internal integration first. Documented benefits include improved decision quality and speed, reduced conflict and sub-optimization, enhanced operational performance across cost, quality, delivery, and flexibility, and improved resilience and responsiveness. A meta-analysis confirms significant positive correlations between internal integration and multiple performance dimensions. These benefits arise because integration overcomes the limitations of functional specialization—where functions optimize their own performance at the expense of overall supply chain performance—by creating mechanisms for information sharing, joint decision-making, and aligned incentives. Research on 445 SMEs shows cross-functional integration significantly enhances partnership, responsiveness, and resilience, with planning times reduced from weeks to hours [5].

Digital platforms have emerged as powerful enablers of cross-functional integration, reshaping possibilities for information sharing, coordination, and collaboration. By providing shared visibility, they create a common information base reducing asymmetry and enabling shared understanding. Real-time visibility into inventory, production, supplier performance, and demand enables coordination based on shared reality rather than divergent perspectives. Analytics enables shared understanding of complex trade-offs, moving functions beyond intuitive negotiation to data-driven optimization. Collaborative platforms enable communication and problem-solving beyond formal

meetings, supporting ongoing interaction that builds relationships and trust. Automated workflows reduce coordination costs and ensure consistent execution. However, digital platforms enable integration only when supported by appropriate organizational conditions; without aligned metrics, empowered decision-makers, and collaborative culture, platforms may provide visibility without action, information without insight, and communication without collaboration. This interdependence underscores the socio-technical nature of cross-functional integration: technology enables integration, but organizational scaffolding—roles, metrics, decision rights, and culture—determines whether integration is achieved. This motivates the framework developed in this paper, which articulates how organizational scaffolding enables digital platforms to generate value through cross-functional integration and Internal Value Co-creation [6].

2.4. Value Co-creation: From External to Internal Contexts

Value co-creation theory, rooted in service-dominant logic, has reshaped understanding of how value is created. Vargo and Lusch's foundational insight is that value is not created by firms and delivered to passive customers but co-created through interaction among actors who integrate resources and apply competencies in service exchange. This challenges goods-dominant logic, which views value as embedded in products and realized through exchange, positioning value instead as value-in-use—realized when customers apply resources to achieve goals. The concept has extended beyond the customer-firm dyad to service ecosystems, where suppliers, partners, and stakeholders interact through resource integration, service exchange, and institutional arrangements. Digital platforms are powerful enablers, providing infrastructure for resource integration, mechanisms for service exchange, and transparency for collaborative value creation. In business ecosystems, platforms enable multiple actors to share data, coordinate activities, and jointly develop solutions no single actor could create independently. The platform economy—Alibaba, Amazon, Uber—represents value co-creation at scale, enabling millions of actors to co-create value through decentralized interactions governed by platform rules [7].

The organizational conditions enabling Internal Value Co-creation extend beyond technical infrastructure to encompass organizational scaffolding shaping how functions interact. Aligned incentives ensure functions are rewarded for joint value creation rather than functional optimization, addressing sub-optimization. Empowerment and decision rights ensure teams have authority for rapid response and adaptation. Collaborative culture and trust create social infrastructure for open communication, constructive conflict, and joint accountability. Leadership commitment signals importance and allocates resources. These conditions interact with digital platforms: platforms provide technical capability for collaboration, while scaffolding provides organizational capability to use platforms effectively. When either is missing, co-creation is constrained—platforms without scaffolding may generate information without action, while scaffolding without platforms may create goodwill without operational capability. The framework developed in this paper articulates this interdependence, proposing that organizational scaffolding and digital platforms jointly enable Internal Value Co-creation through enhanced cross-functional integration. By extending value co-creation theory to internal contexts and articulating enabling organizational conditions, the framework contributes to both value co-creation theory and digital transformation literature, offering a theoretically grounded, practically relevant perspective on organizing for digital value creation [8].

2.5. Socio-technical Systems Theory: Technology and Organization as Interdependent

Socio-technical systems theory, originating in Tavistock Institute research on post-war British coal mining, offers a powerful lens for understanding technology-organization interdependence in digital supply chain transformation. Researchers observed that introducing new technologies without

corresponding changes to work organization and social relationships produced suboptimal outcomes—a finding remarkably prescient for contemporary digital transformation challenges. The core premise is that organizations comprise two interdependent subsystems: the technical subsystem (tools, technologies, processes, workflows) and the social subsystem (people, structures, relationships, culture, norms). These are mutually constraining and enabling, such that changes in one necessitate corresponding changes in the other. The principle of joint optimization holds that superior performance comes from designing and managing both subsystems simultaneously rather than optimizing one at the expense of the other. Optimizing the technical subsystem without the social creates a misaligned system where capabilities are underutilized, motivation suffers, and expected improvements fail to materialize. Conversely, focusing exclusively on social aspects without technical investment yields positive relationships but lacks operational infrastructure for competitive performance (Pasmore et al., 1982). The perspective thus highlights the danger of both technology-centric initiatives neglecting organizational dimensions and culture-focused initiatives neglecting technical infrastructure.

Applying socio-technical theory to digital supply chain transformation yields important insights, yet the theory has been surprisingly underutilized in this context. In the digital supply chain, the technical subsystem encompasses digital platforms—ERP, MES, WMS, IoT, analytics, AI—enabling visibility, intelligence, and adaptivity. The social subsystem encompasses organizational scaffolding—roles, decision rights, metrics, coordination mechanisms, culture—shaping how individuals and functions interact, share information, and decide. Joint optimization suggests firms must invest in both and ensure alignment. When firms implement sophisticated platforms while leaving structures and practices unchanged, they create misalignment: the technical system enables transparency, but the social system—with silos, conflicting metrics, and hierarchical decision-making—prevents effective use. Conversely, redesigning structures without digital investment creates expectations existing infrastructure cannot meet. Misalignment manifests as organizational friction: information technically available but not shared due to silos; insights generated but not acted upon due to unclear decision rights; collaboration opportunities not pursued due to misaligned incentives. Socio-technical theory suggests successful transformation requires joint optimization: platform investments must accompany corresponding investments in organizational scaffolding. This insight is central to the framework developed in this paper, which articulates how organizational scaffolding and digital platforms jointly enable Internal Value Co-creation. The framework operationalizes socio-technical principles for the digital supply chain, specifying the elements of scaffolding necessary to realize platforms' value creation potential. By grounding the framework in socio-technical systems theory, the paper addresses a significant gap in both digital transformation and organizational design literatures, providing a theoretically grounded, practically relevant perspective on organizing for digital supply chain success.

3. Conceptual Framework Development

Organizational scaffolding refers to the formal and informal structures—roles, decision rights, metrics, coordination mechanisms, and culture—that enable coordination, collaboration, and value creation across functions. The metaphor is intentional: like physical scaffolding supporting construction, it provides essential support during transformation while new capabilities are built, enabling adaptation without becoming rigid. In digital supply chain transformation, scaffolding is critical because digital platforms generate information, not value; information creates value only when interpreted, shared, and acted upon across boundaries. When scaffolding is absent or misaligned, organizational friction emerges—silos block information sharing, misaligned metrics create perverse incentives, unclear decision rights delay action, and cultural resistance leads to underutilization. The

framework articulates five interdependent scaffolding components: roles providing accountability for cross-functional processes (notably the process owner, enabled by digital visibility); decision rights empowering frontline actors with real-time information while clear scope, aligned metrics, and coordination mechanisms mitigate risks of inconsistency or local optimization; performance metrics and incentives that replace functional sub-optimization with cross-functional measures like total landed cost, perfect order fulfillment, and cash-to-cash cycle time; coordination mechanisms combining formal (structures, governance, planning), informal (networks, trust, ad hoc problem-solving), and digital (dashboards, collaborative platforms, automated workflows) elements; and culture characterized by transparency, collaboration, data-driven decision-making, learning orientation, and adaptability. These components are mutually reinforcing—aligned metrics support collaborative culture, process roles support shared accountability, platforms support transparency—while misalignment undermines them. Digital platforms function as boundary objects: shared across communities with different interpretations yet enabling coordination through common representations of reality (e.g., a dashboard read differently by procurement, production, sales, and logistics). However, platforms provide technical infrastructure for collaboration, not organizational capability to use it; without scaffolding they may be ignored, resisted, or underutilized. Scaffolding thus bridges platform capability and platform use.

4. Propositions Development

Proposition 1: The adoption of integrated digital platforms—encompassing Enterprise Resource Planning, Manufacturing Execution Systems, Warehouse Management Systems, and analytics capabilities—positively influences cross-functional integration by providing shared visibility, common data, and coordination capabilities that enable functions to share information, coordinate decisions, and collaborate on problem-solving.

The theoretical logic underlying Proposition 1 draws primarily from information processing theory, which holds that organizations face uncertainty to the extent they lack information about environmental conditions and the outcomes of their actions. In supply chains, functional silos create information asymmetries that impede coordination: procurement lacks visibility into production schedules, production into supplier performance, and logistics into customer demand. These asymmetries generate uncertainty, forcing decisions based on incomplete information and leading to suboptimal outcomes such as excess inventory, expedited shipments, and service failures. Integrated digital platforms address this by creating a shared information infrastructure providing all functions access to the same real-time data, reducing asymmetries and enabling more informed decision-making. When procurement, production, logistics, and sales share a common view of inventory, production status, supplier performance, and customer orders, they can coordinate based on shared understanding rather than divergent perspectives. This shared visibility is the foundation upon which cross-functional integration is built. The boundary object properties of platforms further explain this: Star and Griesemer's concept refers to objects shared across communities but interpreted differently by each, enabling collaboration without shared expertise. An integrated dashboard displaying real-time inventory, production, and orders serves as a boundary object—procurement reads it in terms of supplier performance, production in terms of capacity utilization, logistics in terms of transportation requirements, sales in terms of fulfillment capability. Despite different interpretations, coordination is enabled because all work from a common representation of reality. This is particularly valuable in complex environments where functions must coordinate without developing full shared expertise, reducing communication barriers by providing a shared reference point transcending functional boundaries.

The empirical evidence supporting the relationship between digital platforms and cross-functional integration, while still developing, is consistent with this theoretical logic. Studies find integrated information systems associated with improved information sharing, better decision-making, and enhanced supply chain performance. Research on enterprise systems documents improvements in cross-functional coordination, though contingent on organizational factors such as top management support, user training, and process redesign. Studies of supply chain integration find IT capability positively associated with both internal and external integration, with integration mediating the IT-performance relationship. However, evidence also suggests the relationship is not automatic: platforms enable integration but do not guarantee it. Firms with sophisticated platforms can still exhibit low integration if organizational factors—functional silos, misaligned metrics, or cultural resistance—prevent effective use. This motivates the interaction effect in Proposition 3, which posits that organizational scaffolding moderates the platform-integration relationship. Proposition 1 establishes the baseline: integrated digital platforms, through informational, analytical, and relational mechanisms, positively influence cross-functional integration by providing shared visibility and coordination capabilities.

Proposition 2: Digital platforms function as boundary objects that enable cross-functional collaboration by creating shared information spaces where functions with different expertise, priorities, and mental models can access common data, develop shared understanding, and coordinate their actions without requiring shared expertise or identical perspectives.

The boundary object concept, originating with Star and Griesemer, offers a powerful lens for understanding how digital platforms enable cross-functional collaboration. Boundary objects are shared across communities but interpreted differently by each, enabling collaboration without requiring shared expertise or identical perspectives. In supply chains, functions—procurement, production, logistics, sales, finance—possess specialized expertise, distinct priorities, and different mental models, creating communication barriers: procurement speaks of supplier management and cost, production of capacity and scheduling, logistics of transportation and warehousing, sales of customer needs and revenue. Despite these differences, functions must collaborate. Digital platforms bridge this gap by providing a shared object—a common information space—that all functions access and interpret through their own lens. An integrated dashboard showing real-time inventory, production status, supplier performance, and customer orders serves as such a boundary object: procurement sees supplier delivery performance, production sees capacity utilization, logistics sees shipping requirements, sales sees order fulfillment. All look at the same data, each interpreting it functionally, enabling coordination without requiring any function to fully understand the others' domains.

However, the boundary object function is not automatic; it depends on platform characteristics and organizational conditions. Platforms must be designed with shared data models accommodating multiple perspectives, intuitive interfaces, and analytical capabilities supporting different functional needs. They must also be implemented with organizational support: training to interpret platform data, governance ensuring data quality and consistency, and leadership modeling platform use. Without these conditions, platforms may fail as boundary objects—ignored by functions that distrust the data, resisted as threatening, or underutilized by those lacking interpretation skills. This motivates the interaction effect in Proposition 3: organizational scaffolding—roles, metrics, and culture—moderates the platform-integration relationship by enabling or constraining the boundary object function. Proposition 2 establishes that digital platforms, through their boundary object properties, enable cross-functional collaboration by creating shared information spaces that transcend functional differences and enable coordination without requiring shared expertise.

Proposition 3: The positive relationship between digital platforms and cross-functional integration is moderated by organizational scaffolding, such that the integration-enabling effects

of platforms are stronger when appropriate roles, decision rights, performance metrics, coordination mechanisms, and collaborative culture are in place, and weaker when these scaffolding elements are absent or misaligned.

The theoretical logic underlying Proposition 3 draws from socio-technical systems theory, which holds that organizations comprise interdependent technical and social subsystems, and optimal performance requires joint optimization. Digital platforms constitute the technical subsystem—tools and infrastructure enabling visibility, communication, and coordination. Organizational scaffolding constitutes the social subsystem—roles, decision rights, metrics, coordination mechanisms, and culture shaping how people interact and decide. Joint optimization implies overall performance depends on alignment between subsystems; when technical capabilities lack matching social capabilities, potential value is unrealized. For cross-functional integration, platforms enable integration only when scaffolding provides the social capabilities to use them effectively. Platforms provide the technical infrastructure for information sharing; scaffolding provides the organizational capability to share, coordinate, and collaborate. Without scaffolding, platforms may provide visibility without action, information without insight, communication without collaboration.

The interaction between platforms and scaffolding is synergistic rather than additive: the combined effect of high platforms and high scaffolding exceeds the sum of individual effects. This synergy arises because they enable each other in a virtuous cycle. Platforms provide visibility and coordination capabilities making scaffolding effective—without platforms, process owners lack information to coordinate and shared metrics lack measurement infrastructure. Scaffolding provides organizational capability making platforms effective—without scaffolding, platforms lack roles to act, incentives to share, and culture to trust. This mutual reinforcement is the mechanism through which joint optimization generates superior outcomes; firms investing in both achieve higher integration than those investing in one alone. The empirical implications are important. For researchers, studies examining platforms and integration should include scaffolding as a moderator; failure to do so may obscure relationships and produce inconsistent findings, and studies should test whether the relationship is stronger with high scaffolding. For practitioners, platform investments should be accompanied by scaffolding investments; firms implementing sophisticated platforms without redesigning roles, aligning metrics, distributing decision rights, and building collaborative culture are unlikely to realize integration benefits. This suggests firms may need to invest in scaffolding before or concurrently with platforms, and that platform value depends on organizational context—firms with strong scaffolding realize greater returns, explaining why some achieve superior digital returns while others do not. Proposition 3 thus positions organizational scaffolding not as secondary but as a critical enabler determining whether platforms deliver on their integration promise.

Proposition 4: The presence of process owners with end-to-end accountability for cross-functional processes positively influences cross-functional collaboration by providing clear responsibility for coordination, establishing authority to resolve conflicts, and creating accountability for cross-functional outcomes.

The theoretical logic underlying Proposition 4 draws from organizational design theory, particularly the distinction between functional and process-based organizing. Traditional functional structures group activities by specialty—procurement, production, logistics, sales—establishing accountability within functional boundaries. While enabling efficiency and expertise, this creates silos impeding cross-functional coordination. When problems span functions—delayed shipments, quality issues, forecast errors—accountability is unclear, and functions may blame each other rather than collaborate. Process-based organizing addresses this through process owners: individuals with end-to-end accountability for processes cutting across functions. In supply chains, these might include an integrated planning manager, a customer fulfillment owner, or a supplier management owner—responsible for entire process performance, not just a functional piece, with authority to coordinate

across functions. By establishing clear accountability for cross-functional outcomes, process ownership provides the foundation for collaboration.

Digital platforms play an important enabling role, providing visibility and coordination capabilities making process ownership effective. Process owners cannot coordinate without visibility into what is happening across the process. Platforms provide this by integrating data from multiple functions into a unified view—a customer fulfillment owner can monitor order status across sales entry, production scheduling, manufacturing execution, warehousing, and transportation, activities crossing multiple domains. Without platform visibility, process owners depend on functional managers for information, limiting their ability to coordinate and hold functions accountable. Platforms also provide coordination mechanisms: shared dashboards enable real-time monitoring, collaborative platforms enable cross-functional communication, automated workflows enable standardization. The integration of process ownership with platforms creates a powerful combination: process ownership provides organizational capability for coordination, while platforms provide technical infrastructure making it effective. The implications are significant. For researchers, studies of cross-functional collaboration should include process ownership as an antecedent, and studies of platform effectiveness should consider it as a contextual moderator. For practitioners, organizations should establish process owners for key cross-functional processes, clearly define their scope and authority, and provide platform capabilities for effective coordination. The shift from functional to process-based organizing requires significant change—reporting relationships, metrics, career paths—and investment in developing process owners' skills, supported by appropriate governance and decision rights. Process ownership is not a one-time design choice but an ongoing capability to be developed and adapted as processes evolve and platform capabilities advance. Proposition 4 thus positions process ownership as a critical scaffolding component enabling cross-functional collaboration, particularly when supported by digital platforms providing needed visibility and coordination.

Proposition 5: The adoption of cross-functional performance metrics—measurement systems that evaluate outcomes spanning multiple functional domains and reward collaborative behavior—positively influences collaborative behavior by aligning incentives across functions, reducing sub-optimization, and creating shared accountability for organizational outcomes.

The theoretical logic underlying Proposition 5 draws from agency theory, which examines how incentives shape behavior where actors have different interests and information asymmetries. In functional organizations, each function has its own metrics: procurement on purchase price variance, production on machine utilization, logistics on transportation cost, sales on revenue growth. These create strong incentives for functional optimization but also perverse incentives undermining overall supply chain performance. Procurement optimizing price may single-source to gain volume discounts, increasing supply risk and inventory. Production optimizing utilization may produce large batches that increase inventory and reduce flexibility. Logistics optimizing transportation cost may consolidate shipments in ways that delay delivery. Sales optimizing revenue may accept orders requiring expedited production, raising costs elsewhere. Each function, pursuing its own metrics, makes decisions rational locally but suboptimal organizationally. This sub-optimization is a primary source of cross-functional conflict and a barrier to collaboration.

Cross-functional metrics address this by evaluating outcomes spanning multiple domains and requiring collaboration. Rather than measuring specialized contributions, they measure end-to-end process outcomes: total landed cost (procurement, logistics, inventory costs); perfect order fulfillment (accuracy, on-time delivery, condition); cash-to-cash cycle time (from paying suppliers to receiving customer payment); and supply chain response time (demand signal to delivery). These create shared accountability—no single function can achieve strong performance alone; all must collaborate. When procurement, production, logistics, and sales are all evaluated on total landed cost, they have incentives to coordinate to minimize total rather than individual costs. When all are evaluated on

perfect order fulfillment, they have incentives to share information and coordinate to ensure accurate, on-time delivery. The mechanisms operate at multiple levels. Motivationally, cross-functional metrics create economic incentives for collaboration by rewarding outcomes depending on cooperation; collaboration becomes instrumentally valuable, reducing the need for top-down coordination and enabling organic, decentralized collaboration. Informationally, they provide feedback on collaborative effectiveness, revealing how well functions work together; when visible to all, they create shared understanding of performance and highlight improvement areas, enabling functions to identify problems, coordinate responses, and track progress. Relationally, they build trust by creating shared accountability and reducing blame; when all functions are accountable for the same outcomes, they have incentives to help each other succeed rather than point fingers, building trust over time.

5. Conclusion & Discussion

This paper has addressed a persistent challenge in digital supply chain transformation: the gap between substantial technology investment and realized performance improvement, arguing this gap arises from neglect of organizational scaffolding—the formal and informal structures enabling collaboration, coordination, and value creation across functions. While firms invested heavily in digital platforms providing visibility, analytics, and coordination, they often failed to develop the scaffolding required to use them effectively; functional silos, misaligned metrics, unclear decision rights, and cultural resistance create friction constraining value creation. Drawing on socio-technical systems theory—which holds that organizations comprise interdependent technical and social subsystems requiring joint optimization—the paper developed the Organizational Scaffolding Model for Internal Value Co-creation, articulating five scaffolding components (roles and responsibilities, decision rights, performance metrics, coordination mechanisms, and organizational culture) and positioning digital platforms as boundary objects enabling cross-functional collaboration when supported by appropriate scaffolding. The paper extended value co-creation theory to internal contexts, introducing Internal Value Co-creation as the process by which multiple functions jointly contribute to organizational value through collaboration, information sharing, and coordinated action enabled by digital platforms and supported by scaffolding.

This paper makes five theoretical contributions to supply chain management and organization theory, collectively offering an integrated framework for how organizational scaffolding and digital platforms jointly enable Internal Value Co-creation. First, it introduces organizational scaffolding as a conceptual bridge between digital platforms and value creation. While digital transformation literature examines technology adoption and organizational design literature explores structural choices, these streams have developed in parallel with limited integration. By articulating scaffolding as formal and informal structures—roles, decision rights, metrics, coordination mechanisms, culture—that enable effective platform use, the paper provides a unifying concept connecting technical and social subsystems. This explains why firms with sophisticated platforms often fail to realize benefits: they invested in technical infrastructure without organizational capability to use it. Scaffolding also provides a framework for diagnosing organizational friction and designing interventions addressing root causes of transformation failure, beyond simplistic explanations like resistance to change.

Second, it extends boundary object theory to digital supply chain contexts, articulating how platforms function as boundary objects enabling cross-functional collaboration without shared expertise or identical perspectives. Star and Griesemer's original concept focused on physical objects like maps and specimens enabling collaboration across communities. This paper extends that logic to digital platforms, arguing shared dashboards, integrated data models, and collaborative platforms serve similar functions, enabling procurement, production, logistics, and sales to coordinate despite

different expertise, priorities, and mental models. The boundary object lens offers a more nuanced understanding than generic "information sharing" explanations: it explains why platforms enable coordination even when functions interpret information differently, highlights platform design features supporting interpretive flexibility, and specifies conditions for effectiveness—data quality, interface usability, organizational support—often overlooked in technology-centric accounts.

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