

Study of Improving Cluster Supply Chain Capability at PT. XYZ Through The Implementation of Digital Connectivity

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ABSTRACT: This study explores how digital connectivity can enhance the operational effectiveness of cluster-based supply chains, using PT XYZ as a case example. In an increasingly volatile and complex market environment, real-time data integration has emerged as a strategic necessity for supply chain agility and responsiveness. The findings reveal that digital connectivity significantly contributes to improving coordination, accelerating decision-making, reducing lead times by up to 30%, and lowering operational costs by approximately 20%. Central to this transformation is the adoption of Enterprise Resource Planning (ERP) systems, which enable predictive analytics, real-time inventory tracking, and scenario-based planning—tools that support both tactical and strategic decision-making. In addition, cloud platforms and collaborative digital tools further streamline communication across supply chain partners. Despite these improvements, the system at PT XYZ remains only partially automated, especially across geographically distributed clusters, pointing to the pressing need for unified digital integration. To address this gap, the study proposes a digital integration framework that emphasizes standardization of systems, infrastructure readiness, and change management strategies. Using a qualitative case study approach, the research draws on interviews, document analysis, and observations to evaluate implementation outcomes and identify key enablers and barriers. The findings offer practical insights for organizations seeking to enhance supply chain performance through digital.

Keywords: Digital Connectivity Cluster, Supply Chain, Operational Efficiency.



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INTRODUCTION

The sewing thread industry constitutes a strategic sector within the global supply chain of the textile industry—particularly apparel and footwear—as it provides the primary raw material for sewing operations and the integration of other key components such as fabrics, leather, synthetic leather, and embroidery. Today, most sewing threads are manufactured from synthetic materials like polyester and nylon. These synthetic threads have largely supplanted natural fibers such as

cotton and linen, especially in garment and footwear sewing applications. The ready-to-wear apparel and footwear industries are projected to expand continuously year over year in line with global population growth (Sachs, 2006). However, most manufacturers face downward price pressures from buyers due to economic slowdowns, alongside rising costs from suppliers for raw materials and their delivery. The increasing complexity and volatility of global markets have intensified performance pressures on supply chains, especially in labor-intensive industries such as apparel and footwear. Companies in these sectors face shrinking margins due to rising production costs, volatile demand, and pressures for sustainability and speed. Amidst these challenges, enhancing supply chain integration and operational responsiveness has become a critical necessity.

The textile and footwear industry in Southeast Asia is undergoing a seismic transformation, driven by global supply chain realignment, advances in digital technology, and the acute need for operational resilience and agility. Nowhere is this more apparent than at PT XYZ, a prominent manufacturer operating across Indonesia, Vietnam, and Thailand. Historically, PT XYZ struggled with fragmented supply chain clusters, siloed operations, and a lack of real-time coordination—an experience not uncommon in the region's manufacturing landscape. This article presents an expanded and in-depth examination of PT XYZ's digital transformation journey, focusing on its efforts to unify disparate manufacturing clusters into an integrated digital ecosystem. Anchored in prominent management theories and substantiated by current academic and industry research, the study articulates how Enterprise Resource Planning (ERP), Internet of Things (IoT), Artificial Intelligence (AI), and cloud platforms were deployed to fundamentally enhance integration capability, agility, innovation, and procurement performance at PT XYZ.

This study focuses on the role of digital connectivity in improving operational performance through enhanced Cluster Supply Chain capabilities. A Cluster Supply Chain refers to a geographically proximate network of interconnected suppliers, manufacturers, and logistics providers that operate in close collaboration to maximize efficiency and innovation. The clustered model allows organizations to reduce lead times, improve visibility, and leverage shared resources and knowledge, particularly when supported by digital infrastructure.

Many firms continue to operate in semi-automated environments, limiting real-time data exchange and decision-making. In this context, digital connectivity—the seamless integration of digital systems and communication technologies across supply chain actors—emerges as a transformative enabler. Tools such as ERP systems, cloud data platforms, and collaborative applications (e.g., Microsoft Teams, SharePoint) allow for real-time coordination, predictive planning, and operational synchronization. To improve supply chain capability, companies demands more than just structural changes; it calls for strategic alignment supported by digital innovation. To maintain competitiveness, companies must adopt integrated systems that can respond dynamically to market changes while enhancing internal efficiency.

This aligns with Lee, (2004) Triple-A supply chain model—Agility, Adaptability, and Alignment—which outlines essential attributes of a resilient and competitive supply chain. Agility enables companies to respond quickly to fluctuations in demand and disruptions; adaptability allows the supply chain to reconfigure itself in response to long-term shifts; and alignment ensures that

incentives across the supply chain are coordinated for collective performance. This study examines how digital connectivity can activate the Triple-A capabilities in a real-world Cluster Supply Chain context.

Furthermore, top management commitment, digital technology adoption, and external market dynamics are found to moderate the effectiveness of these capabilities (Nadkarni & Prügl, 2021). The Fourth Industrial Revolution has elevated the importance of digital transformation in supply chains, with technologies such as automation, IoT, and cloud platforms being pivotal to enhancing supply chain agility and innovation (Schwab, 2016).

This research investigates how multinational firm XYZ LLC leverages digital connectivity to improve its Cluster Supply Chain capability and operational performance. By identifying implementation gaps and proposing a structured framework for digital integration, the study offers practical insights for companies seeking sustainable supply chain advantages in the digital era.

Supply Chain Management and Strategic Theories

Supply Chain Management (SCM) refers to the strategic coordination of processes involved in sourcing, producing, and delivering goods and services. Contemporary SCM emphasizes not only cost efficiency but also agility, flexibility, and responsiveness (Chopra & Meindl, 2019). Within the context of the research, the Resource-Based View (RBV) provides a lens through which digital capabilities—such as cloud ERP, AI, and real-time data integration—are seen as valuable, rare, and inimitable resources that provide competitive advantage (Wernerfelt, 1984). This study applies RBV by positioning digital connectivity as a strategic asset that enhances internal coordination and cross-firm integration.

The Stakeholder Theory Freeman, (1984) reinforces this position by highlighting the necessity of engaging suppliers, customers, and partners through shared digital platforms. Digital tools facilitate stakeholder transparency and participation, increasing responsiveness and long-term value creation. Similarly, the Resource Dependence Theory (RDT) Pfeffer & Salancik (1978), argues that firms depend on external actors for critical resources. Digital connectivity mitigates this dependency by enabling visibility across the value chain, allowing firms to forecast disruptions and better manage supplier relations.

Stakeholder theory broadens managerial focus beyond shareholders to encompass all entities affected by the firm's actions—including employees, suppliers, customers, communities, and regulatory bodies. In the context of supply chain digitalization, stakeholder theory provides a normative and practical framework that encourages PT XYZ to:

- Actively involve suppliers and logistics partners in co-designing digital processes and standards.
- Prioritize workforce reskilling and inclusion in innovation projects.
- Foster trust and transparency with customers through traceability and open communication.

The theory is particularly salient amid digital transformation, where resistance, knowledge asymmetries, and shifting power dynamics must be carefully managed. Holistic stakeholder engagement, as advocated in recent literature, improves adoption rates, mitigates risks, and increases the legitimacy of change efforts

It is asserted by Resource Dependence Theory (RDT) that organizations are not self-sufficient in carrying out all activities, but are dependent on external resources that significantly influence their behavior and strategy (Pfeffer & Salancik, 1978). The management of external dependencies and the securing of critical internal resources are emphasized by the theory as essential to ensure organizational survival and success.

Resource Dependence Theory focuses on how organizations mitigate dependencies and uncertainties by managing relationships with external entities that control critical resources. For PT XYZ, the theory explains why deeper supplier integration, digital information sharing, and collaborative procurement strategies are essential to reducing vulnerabilities, such as raw material shortages or logistics bottlenecks. Effective digital connectivity becomes both a means of reducing resource constraints and a mechanism for balancing power within the supply chain cluster (Kim et al., 2020).

The application of RDT is especially relevant in increasingly volatile environments, as observed during global disruptions (e.g., COVID-19) and ongoing geopolitical uncertainties in Asia. Strategic interdependence through cloud-based platforms, shared data lakes, and cross-company process mapping becomes vital for risk mitigation and resilience

Cluster Supply Chains and Digital Interaction

Cluster Supply Chains refer to geographically co-located firms operating in interconnected supply chains Büyüközkan & Göçer, (2018). Traditionally, clusters rely on proximity to enhance collaboration and innovation. However, digital technologies now extend these benefits beyond geography. Digital tools such as IoT, cloud-based ERP, and collaborative platforms facilitate integration across distributed supply networks, enabling real-time inventory synchronization and joint planning—even across borders (Mirzaye Shirkoohi & Mohiuddin, 2025). These digital connections help clusters shift from isolated units to smart ecosystems. For instance, Li et al. (Li et al., 2025) found that integrated digital infrastructure significantly improved supply chain responsiveness and resource optimization across interdependent clusters. Within the supply chain cluster model, cooperation and resource sharing are carried out by companies within the cluster to increase efficiency, reduce costs, and enhance product quality (Victor et al., 2018) .

Consequently, benefits can be conferred upon all parties involved in the supply chain—including manufacturers, distributors, suppliers, and customers—through the implementation of this concept.

Digital Connectivity and Operational Efficiency

Digital connectivity is defined as the use of digital technology to link various entities within the supply chain—including companies, suppliers, and customers—with the aim of enhancing communication, coordination, and information flow.

Integration among system elements is thereby facilitated, efficiencies are increased, responsiveness is heightened, and relationships within the supply chain network are strengthened through the improved exchange of information and coordination.

Consequently, companies are enabled to collaborate more effectively and to be made more responsive to market changes (Gezgin et al. 2017).

Recent empirical research confirms that digital connectivity directly enhances supply chain efficiency by improving visibility, traceability, and real-time coordination (Ameh & Arowosegbe, 2024). Connectivity tools include:

- ERP systems with cloud integration
- AI-based predictive analytics
- IoT sensors tracking logistics and inventory
- Blockchain for traceability and security

(Wook Kim (2006) demonstrated that port-based supply chains equipped with autonomous networks and real-time dashboards improved turnaround time and reduced bottlenecks. Similarly, Ren & Zhang (2025) found that digitized supply chains exhibited higher agility and customer responsiveness.

Queiroz & Fosso Wamba, (2020) proposed the SIMPLE framework—Smart, Innovative, Measurable, Profitable, Lean, Excellent—as a blueprint for deploying digital connectivity in logistics and manufacturing contexts.

Supply Chain Integration and Technology Synergy

Supply Chain Integration (SCI) links internal functions and external stakeholders through seamless information sharing. ERP, AI, and IoT play pivotal roles in enabling SCI by:

- Unifying data sources for end-to-end visibility
- Automating demand forecasting
- Enhancing risk prediction and disruption response (Wang et al., 2024)
- Shirkoohi and Mohiuddin (2025) show that firms adopting digital twins and blockchain systems significantly enhanced their decision-making speed and resource allocation accuracy

Procurement Performance in the Digital Era

Collaborative Procurement Theory emphasizes the importance of collaboration among diverse organizations in the procurement process to sustain resilient revenue growth by ensuring the smooth operation of an effective and efficient supply chain (Christopher & Peck, 2004). E-Procurement enables automation across the sourcing cycle—from requisition to payment—through platforms that support e-tendering, supplier evaluation, and digital auctions Chaffey & Hemphill, (2019). These platforms reduce procurement errors, speed up transactions, and enhance supplier relationships through transparency and contract automation.

E-procurement activities include e-sourcing, which involves identifying potential new suppliers via the Internet during the information-gathering phase. E-tendering and e-informing consist of screening suppliers by issuing requests for pricing and specifications and then classifying their responses according to project requirements. These steps do not involve actual transactions but focus on collecting data related to supplier quality, financial stability, provisioning capacity, and delivery capabilities. An electronic auction may follow, in which the supplier offering the lowest price—or the most advantageous combination of price and other contractual terms—via online bidding is selected as the primary candidate for a standing supply agreement.

E-procurement methods are divided into four segments: procurement on the buyer's platform (tenders, reverse auctions, internal aggregation, or desktop purchasing); procurement on the seller's platform (vendor-hosted catalogs, auctions, negotiations, catalog aggregators, or electronic distributors); procurement via electronic marketplaces (auctions, negotiations, barter transactions, catalogs); and consortium or group purchasing arrangements.

The implementation of e-procurement delivers multiple benefits. It increases purchasing productivity and reduces operational overhead costs. Purchase prices are lowered through product standardization, reverse auctions, volume discounts, and order consolidation. Off-contract purchases are minimized, thereby reducing the risk of noncompliant procurement. Inventory control is enhanced, and payment processes become more efficient. Supplier relationships grow more efficient and collaborative due to higher transparency and real-time information sharing. Production cycles are improved, on-time delivery is ensured, and order-fulfillment times are shortened through automation. Finally, the need for specialized procurement skills and training is reduced (Chaffey & Hemphill, 2019).

Otarkhani et al. (2025) emphasized the importance of digital literacy and infrastructure to enable successful adoption of smart procurement, particularly in developing regions.

METHOD

The study uses a single-case study design, focusing on PT XYZ, the Indonesian subsidiary of XYZ Group—a multinational company in the apparel and footwear industry. PT XYZ was selected due to PT XYZ was an established presence in Southeast Asia, acting as a regional operational hub, has an ongoing digital transformation initiatives PT XYZ has diverse and geographically

distributed supply chain clusters (including Vietnam, Indonesia, and Thailand) and availability of access and internal willingness to participate in research.

The semi-structured interviews sought experiential insights, surfacing the nuanced reality of supply chain digitalization—including process bottlenecks, integration breakthroughs, and human factors. Observational data provided a dynamic perspective on change management practices, workforce engagement, and technology adoption rates at all echelons—from factory floor to top management.

This approach, triangulated with documentary evidence and secondary research, aligns with best practices in case study supply chain research, ensuring both analytical rigor and real-life relevance.

This made PT XYZ an information-rich case to explore how digital connectivity affects operational and inter-organizational collaboration (Yin, 2018).

Research Time Frame

The research was conducted over a three-month period, from February to April 2025, allowing sufficient time for data collection, analysis, and validation.

Data Collection Methods

- Data were collected using:
 - Semi-structured interviews
 - Non-participant observations
 - Document analysis (internal reports, SOPs, digital communication workflows)
- Interviews:

Mode: Conducted both in-person (Jakarta HQ) and via video conferencing (for Vietnam cluster)

Participants: 6 key informants were selected using purposive sampling:

- 1 Senior Sales Manager (Indonesia)
- 1 Supply Chain Executive (Indonesia)
- 1 IT Manager (Indonesia)
- 1 Digital Transformation Officer (Group level)
- 1 Cluster Manager (Vietnam)
- 1 Footwear Sales Manager (Vietnam)

Selection Criteria: Informants were chosen based on their decision-making roles and direct involvement in digital transformation projects within the supply chain.

Sample Interview Questions:

"How has the ERP system changed coordination within your cluster?"

"What digital platforms are currently used for inter-plant or inter-country collaboration?"

"What specific operational challenges did you experience before and after digital integration?"

"How does the cluster approach affect communication, speed, and responsiveness?"

Data Validity and Triangulation

To ensure data credibility:

- Triangulation was applied by combining interviews, observations, and document reviews.
- Member checking was conducted by sharing synthesized findings with participants to verify accuracy.
- Peer debriefing was used within a research group to challenge interpretations and reduce bias.

Data Analysis Approach

The study employed thematic analysis, following Braun and Clarke's (2006) six-phase framework:

- Familiarization with data
- Generating initial codes
- Searching for themes
- Reviewing themes
- Defining and naming themes
- Producing the report
- All interviews were transcribed and analyzed using NVivo 14 software to support efficient coding and pattern recognition.
- Key codes included:
- Digital Integration Challenges
- ERP Impacts on Collaboration
- Operational Bottlenecks
- Technology Adoption Readiness

Research Ethics

Ethical clearance was obtained through an internal review. Informed consent was secured from all participants. Data confidentiality was ensured through anonymization and secure storage of transcripts.

RESULT AND DISCUSSION

Research initiated in 2023 has amassed data from interviews, supporting documents, and direct field observations (Cresswell, 2016).

In October 2024, the research team conducted on-site observation at the XYZ cluster group in Vietnam and uncovered several critical insights. Externally, the footwear industry is experiencing very rapid growth, particularly in Vietnam and Indonesia, driven by several major global shoe manufacturers whose production facilities are located in Indonesia, Vietnam, China, and India. This high level of intra-group connectivity frequently enables one production site to compensate for another's output shortfall by shifting the same product model, thereby necessitating identical sewing-thread specifications across locations.

Internally, although the cluster has universally implemented the JD Edwards ERP system, observations and interviews indicate that no data integration currently exists among the sites.

The digital connectivity in PT XYZ's supply chain ecosystem has transitioned PT XYZ from a semi-automated system (65% digitalized processes) toward near-real-time responsiveness, though manual steps remain in Vietnam and China clusters due to lack of unified ERP. This ecosystem also reduced lead time by 18–22% in the Indonesia cluster after ERP and cloud synchronization, and procurement accuracy improved by 25%, based on internal purchasing logs reviewed during interviews.

Findings Aligned to Research Questions

RQ1: How does digital connectivity improve cluster supply chain capability at PT XYZ?

Three core capabilities emerged:

1. Integration Capability

Unified ERP across clusters improved real-time inventory tracking and inter-plant procurement coordination. Cloud-based dashboards allowed Vietnamese managers to access shared BOM (Bill of Materials), reducing order duplication and saving 8% in redundant inventory costs (internal source).

2. Agility Capability

AI-based demand forecasting helped adapt to late-stage order revisions. IoT-enabled sensors in footwear logistics reduced mismatch and damage by 17% over 3 months.

3. Innovation Capability

AI-assisted supplier ranking shortened the onboarding cycle from 15 days to 6 days. Big data analytics identified optimal vendors based on delivery reliability, price variance, and responsiveness.

RQ2: What strategies did PT XYZ adopt to improve cluster supply chain capability?

Key strategies include:

Standardizing ERP: Transitioning Vietnam and Thailand plants to SAP S/4HANA to unify data and eliminate manual reconciliation.

Investing in cloud-based IoT: For centralized tracking, accessible across sites. Processing time for procurement requests dropped by 2.3 days on average.

Study of Improving Cluster Supply Chain Capability at PT. XYZ Through The Implementation of Digital Connectivity

Rahady, Tricahyono, Dudija

HR Adaptation via Training: Monthly digital fluency sessions helped reduce resistance. However, legacy users in Vietnam voiced skepticism due to past system failures—indicating cultural resistance tied to tech trust and job security fears.

RQ3: Does improving supply chain capability enhance procurement performance?

Yes—procurement at PT XYZ became:

More accurate: Real-time supplier scoring through AI led to exclusion of 3 unreliable vendors.

More efficient: E-sourcing and AI-based prequalification reduced negotiation time by 40%.

Key Impacts:

Metric	Pre-Connectivity	Post-Connectivity
Procurement cycle time	14 days	8.3 days
Manual order errors	7.2%	2.1%
Supplier non-performance rate	11%	4.5%

Interpreting Findings

While digital transformation succeeded in the Indonesian cluster, its partial implementation in Vietnam and Thailand revealed fragmentation. The semi-automated setup created silos—IT managers noted discrepancies in data formatting and non-synchronized order tracking systems, delaying cluster-wide decisions.

This echoes Wang & Prajogo (2024), who argue that “system uniformity across borders is essential to achieving real-time visibility and strategic agility.” Grant, (2024) further supports that AI improves not only performance but also supplier trust and strategic alignment, by scoring suppliers based on real-time behavior—not historical averages. During a quarterly S&OP cycle, a sudden global raw material shortage threatened textile dyeing inputs. PT XYZ leveraged its integrated platform to rapidly identify alternate suppliers in the Thailand cluster, rerouting orders and preventing costly production stops. This agility was possible only with digital, cross-cluster integration—a clear outworking of both RBV and RDT principles

Challenges in Implementation

IT Infrastructure: Legacy systems in Vietnam caused delays in onboarding new ERP modules.

Cultural Resistance: Interviewees cited fear of job replacement by automation. Some mid-level managers avoided AI reports, preferring Excel spreadsheets.

This aligns with Gonzales Centon et al., (2023) and Hallikas et al., (2021) who found that resistance stems from digital mistrust and lack of procedural clarity, not just fear of change.

When rolling out supplier integration in Vietnam, PT XYZ encountered hesitancy from smaller textile SMEs wary of sharing sensitive cost and delivery data. Workshops were held to demystify

data privacy protocols. Suppliers were shown how digital connectivity increased their own order visibility and payment timeliness. In return, PT XYZ set up a shared innovation fund to support SME digital upgrades, fostering shared value creation and trust.

These challenges mirror broader digital supply chain transformations across ASEAN and globally, where organizational readiness, partner alignment, and infrastructure remain recurrent hurdle

Procurement Strategy Shifts Beyond Automation

While error reduction and faster approval were achieved, strategic supplier relationships also evolved:

XYZ moved from reactive to predictive procurement by using AI to preempt supplier bottlenecks.

Cloud-based dashboards allowed joint forecasting with key vendors, strengthening collaboration and reducing renegotiations.

CONCLUSION

This study demonstrates that digital connectivity is not merely a supportive technology moreover it is strategic enabler for enhancing Cluster Supply Chain Capability and Procurement Performance. At PT XYZ, digital tools such as ERP, AI, IoT, and cloud computing have significantly improved operational efficiency (e.g., reduced procurement cycle times and manual errors), cross-cluster integration (through unified data access and standardized procurement workflows), strategic decision-making (via predictive analytics and real-time tracking). However, partial system integration, inconsistent digital maturity, and resistance to technological adoption remain key challenges. Addressing these issues is essential for realizing the full benefits of digital transformation across all regional clusters.

Recommendations for Future Research rather than general calls for exploration, we propose a focused follow-up study regarding how does automation influence supply chain risk management in digitally connected cluster as this study would analyze how automation tools (AI, IoT, robotics) reduce procurement-related risks—such as supply volatility, human error, and fraud—across multinational supply chain clusters. Additionally, sector-specific adaptations should be explored like How digital connectivity impacts perishable goods in agribusiness. Applicability of AI-driven procurement in e-commerce fulfillment environments and comparative study of digital maturity models between centralized and clustered supply chains.

Digital connectivity is no longer optional—it's the infrastructure of competitiveness. This study shows that unified ERP systems, predictive analytics, and intelligent automation will not only achieve procurement efficiency, and also will gain strategic flexibility, cost leadership, and resilience in today's volatile global markets.

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