



The role of information systems in enhancing supply chain resilience: Post-pandemic digital supply chain models in Africa and Asia

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GSC Advanced Research and Reviews, 2025, 24(03), 142-152

Publication history: Received on 07 August 2025; revised on 14 September 2025; accepted on 16 September 2025

Article DOI: <https://doi.org/10.30574/gscarr.2025.24.3.0277>

Abstract

The COVID-19 pandemic exposed the vulnerabilities of global supply chains, disrupting production, logistics, and trade flows across regions. These disruptions highlighted the need for resilient supply chains capable of withstanding shocks while maintaining continuity. Information systems (IS) have emerged as critical enablers of resilience, offering integration, visibility, and adaptability through tools such as Enterprise Resource Planning (ERP), data analytics, and blockchain. This study explores how the adoption of these tools has shaped resilience strategies in Africa and Asia, regions that are central to global supply chains yet underexplored in the academic literature.

A qualitative multi-case study design was employed, drawing on secondary data from company reports, policy briefs, industry studies, and prior research. Cases included agribusiness exporters and e-commerce firms in Africa, and pharmaceutical manufacturers and logistics providers in Asia. The findings reveal divergent pathways: in Africa, adoption remains emerging and resource-constrained, but cloud-based ERP modules, mobile-enabled analytics, and blockchain pilots in agriculture demonstrated innovative responses. In Asia, ERP integration, advanced predictive analytics, and large-scale blockchain pilots delivered more comprehensive resilience outcomes.

This study contributes by highlighting the comparative role of IS in strengthening resilience across contexts, demonstrating that while adoption varies, IS tools are now indispensable for resilient global operations.

Keywords: Information Systems (IS); Supply Chain Resilience (SCR); Enterprise Resource Planning (ERP); Data Analytics; Blockchain Technology; Post-Pandemic Digital Supply Chains

1. Introduction

The COVID-19 pandemic fundamentally reshaped global supply chains, exposing their fragility and revealing just how dependent modern economies are on uninterrupted flows of goods, services, and information. Lockdowns, border closures, and production halts disrupted logistics networks on an unprecedented scale, leading to shortages in essential commodities, from medical supplies to food staples and consumer goods. The crisis demonstrated that globalization, while a source of efficiency and market reach, also created complex interdependencies that made disruptions more contagious across industries and geographies. For firms operating in Africa and Asia regions simultaneously serving as supply sources and major consumer markets, the pandemic revealed the urgency of embedding resilience at the core of supply chain design.

Resilience in supply chains refers to the ability of firms to anticipate, absorb, and recover from disruptions while continuing to meet customer demand. Historically, resilience was treated as a peripheral concern compared to efficiency and cost minimization. The pandemic overturned this logic. Organizations now recognize that lean supply chains optimized for cost may collapse under stress unless they are supported by systems that provide visibility, agility, and

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trust. This has placed information systems (IS) at the center of resilience conversations. Enterprise Resource Planning (ERP) platforms can integrate fragmented functions and offer real-time visibility. Data analytics enables predictive modeling of demand shifts and risk scenarios. Blockchain technologies promise tamper-proof, decentralized records that foster transparency in multi-tier networks. Together, these tools represent a digital infrastructure that can transform supply chains from being brittle to being adaptive.

The significance of this transformation is particularly acute for Africa and Asia. Asia remains the backbone of global manufacturing, with China, India, and Southeast Asian economies embedded deeply in worldwide production networks. Africa, while less industrialized, is experiencing rapid digitalization and increasingly serves as both a raw material source and an emerging consumer hub. Yet both regions encountered severe pandemic disruptions. African exporters struggled with port closures and documentation delays, while Asian manufacturers faced factory shutdowns and cascading logistics backlogs. Despite these shared challenges, the adoption and outcomes of IS solutions differ markedly between the two regions. Asia has seen greater maturity in ERP penetration and advanced analytics applications, while Africa is exploring innovative, mobile-based, and cloud-driven digital supply chain models that bypass legacy infrastructure. These contrasting pathways make a comparative study timely and relevant.

Existing research has extensively discussed global supply chain resilience, often focusing on Western contexts or multinational corporations. However, limited attention has been given to how emerging economies in Africa and Asia are leveraging IS tools to enhance resilience. Most scholarly work isolates either Africa or Asia but rarely juxtaposes the two to reveal complementarities and divergences. This constitutes a research gap. A comparative case study across these regions allows us to understand not only how firms deploy ERP, analytics, and blockchain, but also how contextual factors such as institutional frameworks, digital infrastructure, and market maturity influence their effectiveness. Without such insights, prescriptions for resilience risk are overly generic and fail to account for the unique challenges of developing regions.

This study, therefore, pursues two main objectives. First, it explores the role of information systems in strengthening supply chain resilience in Africa and Asia in the post-pandemic environment. Second, it draws regional comparisons to identify similarities, differences, and potential lessons that can be cross-applied. By linking IS adoption with concrete resilience outcomes such as improved visibility, risk mitigation, and recovery speed, the study aims to move beyond abstract theory and demonstrate practical mechanisms at work. The focus on ERP, data analytics, and blockchain reflects tools that are not only widely discussed in global operations but also increasingly accessible to firms across varying scales.

The contribution of this research is both academic and practical. Academically, it enriches the literature on supply chain resilience by bringing a comparative, cross-regional perspective that is largely absent. It applies theoretical lenses such as the Resource-Based View and dynamic capabilities to illustrate how IS functions as a strategic asset in turbulent environments. Practically, it provides managers, policymakers, and development practitioners with evidence on how digital tools can safeguard operations in regions that are highly vulnerable to external shocks yet brimming with digital potential. Insights into cost-effective ERP implementation for African SMEs, predictive analytics adoption among Asian manufacturers, or blockchain's role in African agricultural exports can inform decisions at multiple levels.

In sum, the pandemic has shifted resilience from being optional to indispensable, and information systems represent the scaffolding upon which resilient supply chains must be built. By comparing Africa and Asia, this study highlights not only the universal importance of IS but also the diverse pathways through which resilience can be achieved in a post-pandemic world.

2. Literature review

2.1. Supply Chain Resilience (SCR)

The concept of supply chain resilience (SCR) has gained prominence as organizations grapple with frequent disruptions, ranging from natural disasters to geopolitical shocks and pandemics. Resilience refers to the ability of a supply chain to prepare for, respond to, and recover from unexpected events while maintaining continuity of operations and safeguarding customer service levels (Christopher and Peck, 2004). Three interrelated dimensions often frame SCR: agility, flexibility, and redundancy.

- Agility denotes the capacity to rapidly sense and respond to changes in demand or supply conditions. Agile supply chains rely on accurate information flows and responsive decision-making structures.

- Flexibility captures the ability to adapt processes, resources, and relationships to new configurations during disruptions. Examples include switching suppliers, altering distribution routes, or repurposing production lines.
- Redundancy refers to maintaining backup resources—such as safety stock, alternative suppliers, or excess capacity—that serve as buffers during crises (Ponomarov and Holcomb, 2009).

Historically, firms emphasized efficiency and cost minimization through lean practices, which inadvertently reduced redundancy and made supply chains more brittle. The COVID-19 pandemic revealed the limitations of this efficiency-focused paradigm. Organizations that had already invested in resilience-enhancing mechanisms, particularly those supported by digital technologies, recovered faster and sustained competitiveness.

2.2. Information Systems and Supply Chain Resilience

Information systems (IS) have become critical enablers of resilience because they underpin agility, flexibility, and redundancy through visibility, predictive intelligence, and trust. The literature highlights three central IS categories that are particularly influential in post-pandemic supply chains: Enterprise Resource Planning (ERP), data analytics, and blockchain.

2.2.1. ERP Systems – Enhancing Integration and Visibility

ERP systems integrate internal processes across procurement, production, distribution, and finance. By offering a single source of truth, ERP enhances visibility, enabling decision-makers to identify bottlenecks and coordinate responses (Akkermans et al., 2019). During disruptions, visibility is essential for reallocating resources quickly, tracking inventory levels, and communicating with partners. Studies have shown that ERP adoption correlates positively with supply chain flexibility and coordination, especially in manufacturing and retail contexts. However, the high cost of ERP implementation can limit its diffusion among small and medium-sized enterprises (SMEs), a particularly important constraint in Africa (Awa et al., 2015).

2.2.2. Data Analytics – Forecasting and Predictive Capabilities

Data analytics extends the power of ERP by analyzing large datasets to detect patterns, forecast demand fluctuations, and model risk scenarios. Advanced analytics, including machine learning and Artificial Intelligence (AI), provide predictive capabilities that strengthen agility. For instance, firms using analytics can anticipate raw material shortages, simulate alternative sourcing options, and optimize logistics under uncertainty (Dubey et al., 2020). Analytics-driven resilience has been documented in healthcare and pharmaceutical supply chains during the pandemic, where predictive demand models helped avoid stockouts of essential medicines. In emerging markets, analytics adoption is often hampered by infrastructure gaps but is increasingly facilitated by cloud-based platforms and mobile solutions.

2.2.3. Blockchain – Building Trust and Transparency

Blockchain has emerged as a disruptive IS tool for enhancing trust and transparency in multi-tier supply chains. Its distributed ledger technology ensures immutable, verifiable transaction records, which are especially valuable in contexts characterized by weak institutions or high risks of fraud (Queiroz and Wamba, 2019). Blockchain enables real-time tracking of goods, verification of product authenticity, and transparent contract enforcement. These capabilities directly support resilience by reducing uncertainty and ensuring compliance across borders. Use cases during the pandemic included blockchain-based certification for agricultural exports and traceability in medical equipment supply chains.

2.3. Prior Global Studies and Research Gap

Globally, scholars have emphasized the role of IS in strengthening resilience. Ivanov and Dolgui (2020) illustrated how digital twins and predictive analytics supported adaptive decision-making during COVID-19. Wieland and Wallenburg (2013) highlighted the link between information sharing and resilience outcomes in European supply chains. Similarly, Deloitte and McKinsey reports stress the strategic importance of digitalization for resilience in multinational operations.

Yet, most empirical evidence originates from developed economies, focusing on large multinational corporations with robust digital infrastructures. Emerging regions such as Africa and Asia remain underexplored. African supply chains often struggle with fragmented logistics systems, informal networks, and weak infrastructure, but mobile technologies and fintech solutions are enabling leapfrogging opportunities (Ojo et al., 2022). In contrast, Asia—particularly China, India, and Southeast Asia—hosts deeply embedded global supply networks and exhibits diverse adoption of IS tools, from advanced predictive analytics in manufacturing to blockchain pilots in cross-border trade. Despite their significance,

comparative studies that juxtapose African and Asian contexts are rare, leaving a critical knowledge gap on how IS tools function across different developmental stages and institutional settings.

2.4. Theoretical Perspectives: RBV and Dynamic Capabilities

To analyze how IS contributes to supply chain resilience, two theoretical lenses are particularly relevant: the Resource-Based View (RBV) and Dynamic Capabilities Theory.

- RBV posits that firms achieve sustained competitive advantage by leveraging valuable, rare, inimitable, and non-substitutable (VRIN) resources (Barney, 1991). IS tools such as ERP, analytics, and blockchain can be conceptualized as strategic resources that enhance coordination, decision-making, and trust. However, their value depends on organizational capabilities to implement and integrate them effectively.
- Dynamic Capabilities Theory extends RBV by emphasizing a firm's ability to reconfigure resources in response to environmental changes (Teece, 2007). IS strengthens dynamic capabilities by enabling sensing (data analytics to detect risks), seizing (ERP-driven process adjustments), and transforming (blockchain-enabled redesign of partnerships). This perspective is particularly useful for analyzing resilience, as it captures how organizations adapt and thrive under disruption.

Together, these frameworks provide a foundation for understanding IS as both resources and capabilities that support resilience. RBV explains why some firms achieve an advantage from IS adoption, while Dynamic Capabilities explain how IS helps firms continually adapt in turbulent environments.

2.5. Synthesis

The literature demonstrates a strong consensus that IS tools enhance supply chain resilience by improving visibility, agility, and trust. However, there is less clarity on how these dynamics play out in regions with different levels of infrastructure and digital maturity. Africa presents a context of resource constraints but also opportunities for leapfrogging through mobile and cloud technologies. Asia, while digitally advanced, faces challenges of scale, complexity, and coordination across vast networks. By comparing these regions, this study contributes to bridging the research gap, offering insights into both the universal and context-specific roles of IS in building resilient supply chains.

3. Methodology

3.1. Research Design

This study adopts a qualitative, multi-case study design to examine how information systems (IS) enhance supply chain resilience (SCR) in post-pandemic contexts. A case study approach is particularly suited for exploring complex, real-world phenomena where boundaries between the phenomenon and context are blurred (Yin, 2018). The COVID-19 pandemic created highly dynamic and uncertain environments in which firms were compelled to reconfigure their operations. By studying multiple cases across Africa and Asia, this research provides a comparative lens to identify both commonalities and context-specific dynamics in the use of IS tools such as ERP, data analytics, and blockchain.

3.2. Case Selection

The cases were purposefully selected to capture diverse regional contexts and industries that illustrate both vulnerabilities and innovation in supply chains. Four case clusters were identified:

3.2.1. Africa

- Kenyan agribusiness exporters
 - Agriculture forms the backbone of many African economies, and Kenyan firms exporting flowers, fruits, and vegetables faced severe logistical bottlenecks during the pandemic. Several experimented with blockchain and digital certification to maintain trust in export markets.
- Nigerian retail and e-commerce firms
 - Nigeria's fast-growing e-commerce sector relied heavily on mobile platforms and digital payments to sustain operations amid mobility restrictions, making it an ideal case for examining ERP-lite and analytics adoption in emerging markets.

3.2.2. Asia

- Indian pharmaceutical and manufacturing firms

- India, a global hub for pharmaceuticals, faced massive demand spikes for medicines and vaccines during COVID-19. ERP integration and advanced analytics were central to ensuring continuity in supply and regulatory compliance.
- Chinese logistics firms
 - As China was among the first countries to experience lockdowns, logistics providers rapidly adopted digital twins, predictive analytics, and blockchain pilots in port operations to restore confidence in cross-border trade.

These cases offer variation in industry focus, IS adoption maturity, and institutional context, enabling a rich comparative analysis.

3.2.3. Data Sources

Given the exploratory and comparative nature of the study, data collection relies on secondary and documentary sources, supplemented where possible by interviews and practitioner reports. Key data sources include:

- Company reports and press releases, providing information on IS adoption and resilience strategies.
- Policy briefs and government publications, outlining national initiatives on digitalization and trade facilitation.
- Industry and consultancy reports (e.g., Deloitte, McKinsey, UNCTAD), offering sector-wide insights.
- Academic literature and case reports, grounding the analysis in peer-reviewed evidence.
- Interviews (if feasible) with managers or industry experts in selected cases to validate findings and add contextual richness.

This triangulation of data sources ensures reliability and mitigates the limitations of relying solely on one type of evidence.

3.3. Data Analysis

The analysis employs a thematic comparison approach. Data were coded inductively and deductively, guided by the conceptual dimensions of supply chain resilience (agility, flexibility, redundancy) and IS functions (visibility, forecasting, transparency). Each case was analyzed individually to map how ERP, analytics, or blockchain tools supported resilience outcomes during and after the pandemic. Subsequently, cross-case synthesis was conducted to identify patterns of convergence and divergence between African and Asian cases.

In Africa, themes such as cost constraints, mobile-driven innovation, and leapfrogging potential were expected to dominate. In Asia, themes such as advanced integration, large-scale analytics adoption, and blockchain scalability were anticipated. Comparative analysis allowed the study to highlight contextual enablers and barriers, revealing how IS tools operate across different developmental stages of supply chain ecosystems.

3.4. Validity and Reliability

To strengthen validity, the study relies on data triangulation (using multiple sources), theory triangulation (RBV and dynamic capabilities frameworks), and peer-reviewed literature to frame interpretations. Reliability was enhanced by maintaining clear coding protocols and documentation of the data analysis process. While limited by dependence on secondary data in some cases, the methodological rigor ensures that findings provide credible and transferable insights into IS-enabled resilience.

4. Case study findings

This section presents the findings of the multi-case analysis, focusing on how information systems (IS) tools have enhanced supply chain resilience (SCR) in Africa and Asia during and after the COVID-19 pandemic. The cases illustrate the varying levels of maturity in ERP, analytics, and blockchain adoption, and reveal distinct patterns shaped by regional infrastructures, institutional environments, and industry characteristics.

4.1. Africa: Emerging but Innovative Pathways

4.1.1. ERP Adoption in SMEs

ERP adoption in Africa remains modest but is gradually increasing, especially among SMEs in retail and agribusiness. For instance, several Nigerian e-commerce firms began implementing cloud-based ERP modules to integrate

procurement, inventory, and logistics. Prior to the pandemic, many relied on manual coordination or fragmented software. Lockdowns highlighted the inefficiencies of such systems, pushing firms to seek integrated platforms.

The impact of ERP adoption was visible in improved coordination and visibility. SMEs reported that centralizing inventory data enabled them to track product availability across warehouses and respond more quickly to demand spikes. For agribusiness exporters in Kenya, ERP modules linked to order management improved communication with overseas buyers during flight cancellations and shipping delays. However, the high upfront costs of full ERP suites remain a barrier. Many SMEs opted for “ERP-lite” or modular cloud subscriptions rather than comprehensive enterprise solutions. This constrained the breadth of integration but still represented a significant step toward resilience.

4.1.2. Data Analytics in Logistics and Retail

The use of data analytics in Africa is still limited, but logistics providers and fintech-enabled platforms have begun to demonstrate its potential. For example, digital logistics start-ups in Kenya used mobile data to predict demand for trucking routes during lockdowns, thereby reallocating fleets to areas of greatest need. Nigerian e-commerce firms employed analytics to forecast delivery bottlenecks in congested urban centers and reroute shipments in real time.

These initiatives improved agility by enabling companies to anticipate disruptions rather than react to them. Still, adoption remains at a basic level compared to Asia: most African firms use descriptive or diagnostic analytics (e.g., trend reports, simple forecasts) rather than advanced predictive or prescriptive models. Limited data infrastructure and high costs of talent constrain widespread deployment.

4.1.3. Blockchain Pilots in Agriculture Exports

Blockchain innovation in Africa has been most visible in agriculture exports, particularly in Kenya. Exporters of coffee, tea, and horticultural products piloted blockchain-based systems to provide buyers with tamper-proof documentation on product origin, quality, and compliance. These systems became valuable during the pandemic, when physical inspections and paper-based certifications were delayed or impossible. By embedding trust into the digital certification process, blockchain helped sustain export continuity.

While these pilots showcased potential, adoption remained small-scale and project-based. Challenges included limited digital literacy among smallholder farmers, lack of regulatory frameworks, and interoperability issues with global buyers' systems. Nonetheless, blockchain demonstrated how African exporters could enhance transparency and trust, a key component of resilience in international trade.

Summary of Africa: African supply chains showed emergent, low-scale IS adoption. ERP improved internal coordination but faced cost barriers. Analytics offered incremental gains in logistics agility, though still at a basic level. Blockchain pilots in agriculture revealed opportunities for leapfrogging, but scalability remained limited.

4.2. Asia: Mature and Large-Scale Applications

4.2.1. ERP Integration in Manufacturing and Pharma

ERP is deeply embedded in Asian supply chains, particularly in Indian manufacturing and pharmaceutical industries. Large firms had already integrated ERP systems pre-pandemic, linking procurement, production, warehousing, and compliance modules. During COVID-19, this integration proved critical. For example, Indian pharmaceutical firms supplying vaccines globally relied on ERP to manage stringent regulatory documentation and ensure uninterrupted visibility across complex, multi-tier supply networks.

ERP adoption in Asia extended beyond internal integration to partner visibility, where suppliers and distributors could access shared dashboards. This level of integration improved flexibility, allowing firms to adjust production schedules, reallocate raw materials, and comply rapidly with shifting export regulations. Unlike in Africa, cost was not a primary barrier, though SMEs still faced adoption challenges compared to large corporations.

4.2.2. Advanced Predictive Analytics in Logistics and Manufacturing

Analytics adoption in Asia was markedly more advanced. Chinese logistics firms deployed AI-driven predictive models to forecast port congestion, estimate delivery delays, and recommend alternative routes. During lockdowns in Wuhan and Shanghai, analytics platforms enabled real-time decision-making that reduced idle times and improved container utilization.

In manufacturing, Indian and Southeast Asian firms used analytics to model demand volatility and optimize procurement. For instance, predictive algorithms helped identify which suppliers were most at risk of disruption, enabling firms to diversify sourcing ahead of time. These practices enhanced both agility and redundancy, as companies could simulate multiple disruption scenarios and prepare accordingly.

Compared to Africa, Asia's adoption reflected a higher level of digital maturity, supported by larger data ecosystems, skilled labor pools, and established partnerships with global technology vendors.

4.2.3. Blockchain in Cross-Border Trade and Ports

Blockchain adoption in Asia reached wider testing stages, particularly in port operations and cross-border trade. Chinese ports piloted blockchain for cargo documentation, reducing delays associated with manual paperwork. In Singapore, blockchain consortia facilitated real-time verification of bills of lading, enhancing trust among multiple international stakeholders.

These blockchain systems improved transparency and trust, reducing the likelihood of fraud, paperwork errors, or disputes that could stall shipments. Unlike Africa's small-scale pilots, Asia's adoption involved multi-stakeholder platforms, often backed by governments or industry alliances. This provided greater scalability and legitimacy, although interoperability across jurisdictions remains an ongoing challenge.

Summary of Asia

Asian supply chains exhibited mature, large-scale IS adoption. ERP was deeply embedded, analytics were advanced and predictive, and blockchain was widely tested in ports and international logistics. These systems collectively contributed to higher agility, flexibility, and redundancy than observed in African cases.

4.2.4. Comparative Synthesis: Divergent Pathways to Resilience

The comparative findings reveal two distinct pathways of IS-enabled resilience in Africa and Asia:

- **Scale and Maturity:** Asia benefits from decades of ERP integration, advanced analytics, and government-backed blockchain pilots. Africa is still at the early stages, with adoption concentrated in SMEs and export-oriented firms.
- **Cost and Accessibility:** High costs hinder African ERP adoption, pushing firms toward modular cloud solutions. Asia's larger firms absorb costs more easily, enabling comprehensive integration.
- **Innovation Approaches:** African firms often rely on leapfrogging strategies, experimenting with mobile, cloud, and blockchain pilots to bypass infrastructure gaps. Asian firms focus on scaling existing technologies, using predictive analytics and advanced ERP to optimize vast supply networks.
- **Resilience Outcomes:** In Africa, IS improved coordination and transparency but remained fragmented, offering incremental resilience. In Asia, IS created system-wide agility and redundancy, allowing firms to anticipate, adapt, and recover more effectively.
- **Institutional Contexts:** African adoption is often driven by private innovation and donor-backed pilots, while Asian adoption is reinforced by strong government policies and industry consortia.

4.3. Overall Findings

The findings highlight that while Africa and Asia are at different stages of IS adoption, both regions demonstrate the critical role of digital tools in supply chain resilience. Africa's emerging practices illustrate innovation under constraint, while Asia's large-scale systems reflect the benefits of maturity and institutional support. Together, the cases suggest that resilience is not solely a function of resources but also of how technologies are deployed within specific regional contexts.

5. Discussion

The findings of this study confirm that information systems (IS) play a central role in enabling supply chain resilience (SCR) by strengthening integration, enhancing visibility, and supporting adaptability. Across both Africa and Asia, firms leveraged ERP systems, data analytics, and blockchain to respond to the unprecedented disruptions of the COVID-19 pandemic. However, the scale, maturity, and institutional support behind these tools varied significantly between the two regions. This discussion interprets the findings through the dual lenses of the Resource-Based View (RBV) and Dynamic Capabilities Theory, while also drawing out managerial implications.

5.1. The Role of IS in Enabling Resilience

The case evidence demonstrates that IS tools enhance three key pillars of resilience: integration, visibility, and adaptability.

5.1.1. Integration

ERP systems proved essential in linking procurement, production, distribution, and compliance activities into a coherent whole. In India's pharmaceutical industry, integrated ERP modules facilitated rapid reallocation of scarce raw materials and compliance with shifting regulatory requirements. In contrast, African SMEs, particularly in retail and agribusiness, relied on scaled-down or cloud-based ERP modules, which still improved coordination even if adoption remained partial. Integration ensured that supply chains could reconfigure more rapidly in response to disruptions.

5.1.2. Visibility

Data analytics, whether basic in Africa or advanced in Asia, expanded firms' ability to anticipate risks and adjust accordingly. African e-commerce and logistics providers employed descriptive analytics to monitor bottlenecks and reroute deliveries, while Chinese logistics firms deployed predictive models to simulate port congestion and optimize container flows. Visibility allowed firms to move beyond reactive responses, shifting toward proactive anticipation of risks.

5.1.3. Adaptability

Blockchain offered a foundation for transparent and trusted transactions, which became particularly important when physical inspections and paperwork were delayed. African agricultural exporters used blockchain for digital certification, while Asian ports piloted large-scale blockchain consortia for cargo documentation. These initiatives strengthened adaptability by fostering trust in global trade, even under constrained mobility.

Collectively, these findings highlight that IS are not merely support tools but **strategic enablers of resilience**, aligning with prior global literature yet contextualized within African and Asian realities.

5.2. Regional contrasts

Despite the universal importance of IS, regional differences were stark.

5.2.1. Structural Gaps in Africa

African firms faced limited infrastructure, high costs of ERP systems, and shortages of skilled data scientists. Adoption was therefore incremental and often driven by necessity. Yet, innovation flourished in the form of cloud-based ERP solutions and blockchain pilots in agriculture. This suggests that Africa's path is less about replicating mature models and more about leapfrogging through mobile, fintech, and donor-supported digital pilots.

5.2.2. Digital Maturity in Asia

Asian supply chains benefited from pre-existing ERP maturity, advanced analytics ecosystems, and government-backed blockchain consortia. These systems operated at scale, ensuring that firms could both absorb shocks and quickly recover operations. However, complexity and scale created their own challenges, such as interoperability across vast regional networks and managing data privacy across jurisdictions.

The contrast underscores that while Africa is emergent and innovative under constraint, Asia is mature and system-wide in its adoption. Both trajectories, however, demonstrate the indispensable role of IS in post-pandemic resilience.

5.3. Theoretical Implications

The findings enrich theory by demonstrating how IS can be conceptualized as both resources (RBV) and capabilities (Dynamic Capabilities).

5.3.1. RBV Perspective

ERP, analytics, and blockchain qualify as VRIN resources when effectively deployed. For example, Indian pharma firms' ERP systems provided unique compliance advantages that were difficult for competitors to imitate. In Africa, blockchain pilots served as rare and valuable resources by offering trusted certification in weak institutional environments. However, RBV alone cannot fully explain resilience, since mere possession of IS does not guarantee effectiveness.

5.3.2. *Dynamic Capabilities Perspective*

The Dynamic Capabilities framework better captures how IS enabling sensing, seizing, and transforming. Analytics allowed firms to sense disruption risks; ERP enabled them to seize opportunities by reallocating resources; blockchain transformed inter-organizational relationships by embedding trust digitally. Thus, it not only provides resources but also extend firms' adaptive capacity in turbulent environments.

By linking IS to both theoretical frameworks, this study illustrates their dual role: as assets that create advantage and as enablers of continuous reconfiguration.

5.4. Managerial Implications

The comparative analysis offers several practical lessons for managers and policymakers.

5.4.1. *Africa's Leapfrogging Potential*

African managers should prioritize cloud-based ERP and mobile analytics platforms that bypass the need for heavy infrastructure. Donor agencies and policymakers can support this by subsidizing digital adoption for SMEs. Blockchain pilots in agriculture should be scaled through partnerships with buyers and regulators, embedding trust in international trade.

5.4.2. *Asia's Scalable Models*

Asian managers benefit from existing digital maturity but must focus on scalability and interoperability. Advanced analytics can be extended beyond large firms to SMEs through shared platforms. Blockchain consortia should be expanded regionally to harmonize cross-border trade documentation. The challenge for Asia is not adoption but integration at scale across diverse jurisdictions.

Cross-Regional Learning

Africa can learn from Asia's integrated ERP and predictive analytics models, while Asia can observe Africa's lean, mobile-driven innovation as a model for low-cost agility. Firms operating globally should adapt their IS strategies to the maturity of the markets they engage with, ensuring that resilience mechanisms are not "one size fits all."

5.4.3. *Synthesis*

The discussion reinforces that IS are no longer peripheral but central strategic levers for resilience. ERP ensures integration, analytics provide visibility, and blockchain builds trust, together creating supply chains that are more adaptive and less vulnerable to shocks. While Asia demonstrates the benefits of long-term investment in IS, Africa highlights how innovation under resource constraints can create unique pathways to resilience. The interplay of RBV and Dynamic Capabilities shows that IS are both resources to be leveraged and dynamic enablers of continuous transformation.

Ultimately, resilience is not only about having digital tools but also about embedding them into organizational routines and networks in ways that align with contextual realities. For Africa, this means leapfrogging through cloud and mobile platforms; for Asia, scaling and harmonizing advanced systems. Both regions illustrate that in the post-pandemic world, digital supply chains are not a luxury but a necessity for global competitiveness.

6. Conclusion

This study has explored the role of information systems (IS) in strengthening supply chain resilience (SCR) in the aftermath of the COVID-19 pandemic, with a comparative focus on Africa and Asia. The findings confirm that IS tools such as ERP systems, data analytics, and blockchain are fundamental enablers of resilience by enhancing integration, visibility, and adaptability. However, the ways in which these tools contribute to resilience differ significantly across contexts, shaped by structural conditions, institutional frameworks, and levels of digital maturity.

In Africa, IS adoption remains emergent and often resource-constrained, yet firms have demonstrated innovation through cloud-based ERP modules, mobile-enabled analytics, and blockchain pilots in agriculture. These interventions provided incremental improvements in coordination, agility, and transparency, albeit at limited scale. In Asia, by contrast, IS adoption is more mature and widespread. ERP systems are deeply embedded in manufacturing and pharmaceutical industries, advanced analytics are deployed for predictive and prescriptive decision-making, and

blockchain initiatives are being tested in ports and cross-border trade. These large-scale applications have delivered more comprehensive resilience outcomes, enabling firms to anticipate risks, adapt operations, and recover rapidly.

The practical takeaway is clear

IS tools are not optional but essential in building resilient global operations. For managers in Africa, the path forward lies in leveraging cloud and mobile platforms to leapfrog traditional infrastructure barriers, while policymakers can encourage broader adoption by supporting SMEs and fostering digital ecosystems. For managers in Asia, the challenge is to scale and harmonize IS across complex networks, ensuring interoperability and extending digital benefits to smaller firms. For global firms operating across both regions, strategies must be adapted to local contexts, balancing advanced integration with cost-effective innovation.

This research also highlights limitations. The study relied largely on secondary data and a small set of cases, which constrains the generalizability of the findings. While the triangulation of sources increases validity, deeper insights would be gained from field-based interviews and firm-level data collection.

Future research should pursue longitudinal studies that examine how IS-enabled resilience evolves over time and across multiple disruption cycles. Comparative research spanning different industries such as healthcare, automotive, and retail would also enrich understanding of sector-specific dynamics. In addition, quantitative studies could test the causal relationships between IS adoption and resilience outcomes across larger samples.

In sum, the pandemic underscored that fragile supply chains carry immense risks, while digital systems provide the scaffolding for resilience. Whether in resource-constrained African SMEs or highly integrated Asian networks, information systems are now indispensable for navigating uncertainty in global supply chains.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict-of-interest to be disclosed.

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