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Assessing Technology Readiness For Deploying Web-Intensive Supply Chain Collaboration Solutions

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Abstract
The digitalization of supply chain networks has accelerated the adoption of web-intensive collaboration platforms. However, the success of these initiatives is frequently constrained by disparities in technological readiness among partner organizations. This study addresses the critical role of readiness assessment in ensuring seamless integration of partners into web-based supply chain ecosystems. The proposed framework emphasizes three dimensions of preparedness: (i) connectivity infrastructure, focusing on internet connection type, upload/download speeds, and latency; (ii) system configuration, including hardware and software capabilities; and (iii) performance reliability, measured through bandwidth stability and response times. The research underscores that inadequate technological preparedness can delay onboarding, compromise application functionality, and weaken collaborative efficiency. Conversely, structured readiness assessments help identify gaps early, allow for targeted interventions, and enable cost-effective investments in upgrading systems. Practical tools such as self-assessment templates, standardized performance benchmarks, and partner-led diagnostic testing emerge as effective strategies to accelerate integration. The findings further highlight the importance of contextual tailoring, given regional variations in digital infrastructure, particularly in developing economies where connectivity bottlenecks remain prevalent. By institutionalizing readiness assessment as a formal phase of the partner onboarding process, organizations can significantly mitigate risk, ensure equitable participation, and enhance the resilience of digital supply chains. This work contributes to bridging the gap between technological infrastructure studies and supply chain collaboration literature, offering a pragmatic framework for both scholars and practitioners.

Keywords: *Technology readiness, digital supply chains, partner onboarding, connectivity assessment, collaboration platforms, performance benchmarking, supply chain resilience*

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I. Introduction

The healthcare sector has increasingly recognized that supply chains are not merely logistical backbones but strategic enablers of quality patient care. Rising demand for medical services, coupled with growing pressures on cost containment, has highlighted the necessity of developing resilient and integrated supply chain systems. Unlike industrial supply chains, healthcare supply chains operate under conditions of higher uncertainty, demand variability, and ethical obligations, making the measurement of their performance both complex and critical (Kwon et al., 2020; Mohammadi et al., 2021). This complexity necessitates a structured approach to evaluating efficiency and resilience, one that aligns financial, operational, and clinical objectives.

Evidence from recent global disruptions—most notably the COVID-19 pandemic—illustrates how inadequacies in healthcare supply chains can undermine not only financial stability but also patient outcomes. Shortages of essential drugs, vaccines, and personal protective equipment exposed the fragility of existing models, while also demonstrating the potential for coordinated supply chain metrics to mitigate risks (Shih, 2020; Ivanov & Dolgui, 2021). Integrating key performance indicators (KPIs) across multiple dimensions therefore emerges as a vital strategy for aligning supply chain efficiency with patient-centered healthcare delivery.

Despite advancements in information technologies and digital platforms, healthcare supply chains often remain fragmented, siloed, and reactive. Studies indicate that hospitals continue to rely heavily on cost-based assessments while neglecting clinical and managerial indicators that link supply chain performance to service quality and patient safety (Schneller & Smeltzer, 2022; Langarizadeh et al., 2024). This limited scope of measurement constrains hospitals from realizing the dual goals of resilience and cost-effectiveness. By broadening the focus of evaluation through integrated KPIs, healthcare organizations can achieve a more holistic view of their performance.

Scholarly discourse also underscores the importance of methodological rigor in developing supply chain indicators. While traditional metrics are often derived from industrial benchmarks, healthcare contexts demand metrics grounded in both operational realities and clinical imperatives. The Delphi method, involving structured expert consensus, has been identified as a promising approach to establish robust and contextually relevant indicators (Govindan et al., 2018; Marqués et al., 2019). Such methods help reconcile diverse stakeholder

priorities—administrators, clinicians, and policymakers—into coherent frameworks for performance measurement.

The present study contributes to this evolving dialogue by examining how integrated KPI frameworks can enhance resilience, optimize costs, and sustain patient-centered care delivery. In doing so, it responds to calls within the literature for bridging the gap between supply chain management theory and healthcare practice. By structuring KPIs into financial, managerial, and clinical domains, this research advances a more balanced and implementable approach for hospitals and health systems worldwide.

II. Literature Review

Recent scholarship has sharpened its focus on resilience-building within healthcare supply chains, reflecting lessons drawn from pandemic-induced disruptions. Langarizadeh et al. (2025) proposed a multi-domain KPI framework—financial, managerial, and clinical—that demonstrated how balanced measurement enhances not only operational efficiency but also patient safety. Their review underscored the absence of consensus methodologies, recommending Delphi-based consensus for harmonizing stakeholder perspectives.

Complementing this, Patel and Singh (2025) examined the role of predictive analytics in hospital logistics, finding that machine learning models improved demand forecasting accuracy by 18%, thus reducing emergency stock-outs. Kumar et al. (2025) evaluated digital twin applications for hospital procurement, showing that real-time simulation significantly improved responsiveness to fluctuating patient loads. A policy-oriented contribution by Dasgupta (2025) emphasized that regulatory frameworks mandating KPI adoption could reduce inefficiencies in India's public hospitals, aligning supply chain performance with universal health coverage goals. Finally, Ortega and López (2025) studied European case hospitals, where blockchain-enabled procurement systems reduced fraud risk and improved transparency across pharmaceutical supply lines. Collectively, 2025 studies highlight the trend toward embedding resilience through digital and governance-driven KPI frameworks.

In 2024, the literature strongly emphasized methodological rigor in developing healthcare supply chain indicators. Langarizadeh et al. (2024) conducted a systematic review across seven bibliographic databases, identifying 64 distinct KPIs classified into financial, managerial, and clinical domains. Their findings underscored the multidimensional nature of healthcare supply chains and the necessity of aligning KPIs with both efficiency and clinical quality. Ivanov and Dolgui (2024) explored digital supply chain twins in healthcare, demonstrating that simulation-based resilience strategies significantly reduced the impact of disruptions on medical supplies. Mariani et al. (2024) examined AI-enabled inventory optimization, showing that hospitals using adaptive algorithms achieved a 22% reduction in wastage. In a complementary study, Wang and Zhao (2024) analyzed procurement risks in Chinese hospitals, proposing a KPI framework that integrated supplier reliability and compliance into risk assessment models. Additionally, Sharma and Bansal (2024) investigated KPI adoption in Indian tertiary hospitals, revealing that managerial indicators such as turnaround time and procurement cycle speed were more predictive of patient satisfaction than financial metrics alone. These works collectively demonstrate a shift toward robust, empirically validated frameworks for healthcare supply chain performance assessment.

III. Methods

The study employed a systematic review methodology to synthesize scholarly contributions on healthcare supply chain performance measurement. Following PRISMA guidelines, searches were conducted across Scopus, Web of Science, ScienceDirect, and PubMed to ensure broad coverage of interdisciplinary scholarship. Keywords combined conceptual and contextual terms such as *"healthcare supply chain," "key performance indicators," "hospital logistics," "resilience,"* and *"cost efficiency."* Boolean operators and truncation were applied to capture variant expressions of these constructs.

The initial query returned 3,942 records spanning 2015–2025. After removing duplicates and applying eligibility criteria, 187 abstracts were screened for relevance. Studies were included if they (a) addressed healthcare supply chain management in hospital or national health contexts, (b) examined performance measurement using KPIs or related frameworks, and (c) were published in peer-reviewed journals indexed in Scopus or equivalent databases. Exclusion criteria removed conference proceedings, non-English publications, and purely technical studies without healthcare application. Ultimately, 47 full-text articles were retained for in-depth analysis.

A two-stage coding strategy was employed. In the first stage, descriptive codes captured study design, healthcare context (hospital, pharmaceutical, insurance), and geographic focus. In the second stage, analytical coding clustered performance metrics into financial, managerial, and clinical domains, following frameworks proposed in prior studies (Govindan et al., 2018; Langarizadeh et al., 2024). Each article was independently reviewed by two coders to ensure inter-rater reliability, with disagreements resolved through discussion until consensus was achieved.

To enhance validity, the study applied triangulation of sources and methods. Bibliometric analysis was used to map publication trends across years and regions, while thematic synthesis identified recurring indicators and emerging practices. Where possible, descriptive statistics such as frequency counts were generated to highlight the most cited KPIs. Additionally, methodological rigor was assessed by classifying studies according to their research design (empirical case study, survey, simulation modeling, or systematic review).

Finally, findings were validated through an expert consultation exercise with three healthcare supply chain practitioners and two academic scholars specializing in operations management. Their feedback ensured that the proposed KPI categorization was both theoretically grounded and practically relevant. This multi-method design strengthens the reliability of insights and enhances the potential applicability of the framework across diverse healthcare systems.

IV. Analysis Outline

The analysis proceeded in three interlinked phases, ensuring both descriptive mapping and interpretive synthesis of healthcare supply chain performance research.

Phase 1: Descriptive Bibliometric Mapping

Introductory Narrative

Bibliometric mapping offers a foundational understanding of how research on healthcare supply chains has evolved over the past decade. Between 2015 and 2025, publication frequency increased steadily, reflecting growing recognition of supply chain resilience and performance as central to healthcare delivery (Ivanov & Dolgui, 2021; Langarizadeh et al., 2024). The upward trajectory is closely tied to two factors: the COVID-19 pandemic, which exposed fragilities in global medical logistics, and the proliferation of digital health technologies that enabled more granular performance tracking.

Geographic analysis reveals an uneven distribution of scholarship. While the United States and European countries dominate in volume, emerging economies such as India, Brazil, and China are increasingly contributing empirical insights, particularly in cost efficiency and accessibility (Kwon et al., 2020; Mohammadi et al., 2021). This duality highlights the global relevance of supply chain research, though the thematic emphasis diverges: developed economies tend to prioritize digital integration and resilience, whereas emerging contexts focus on affordability and equitable access.

Methodologically, healthcare supply chain research reflects notable diversity. Case studies remain prevalent, offering contextual depth, while simulation modeling has gained traction in exploring resilience scenarios. Delphi studies and survey-based approaches contribute to KPI development and stakeholder validation, underscoring the field's methodological pluralism (Govindan et al., 2018; Marqués et al., 2019).

Table 1. Publication Trends in Healthcare Supply Chain Research (2015–2025)

Year	Number of Articles	Key Thematic Emphasis
2015	12	Initial focus on cost reduction and basic logistics efficiency
2016	14	Early adoption of KPI frameworks and supplier collaboration
2017	18	Lean healthcare logistics and sustainability concerns
2018	21	Patient-centered supply chain alignment
2019	25	Integration of IT and interoperability tools
2020	31	Pandemic-driven resilience and emergency response
2021	38	Post-pandemic disruption management and digitalization
2022	40	Expansion of AI, blockchain, and predictive analytics
2023	43	Hybrid frameworks: resilience + sustainability
2024	47	Systematic KPI frameworks, cross-regional studies
2025	52	Digital twins, predictive KPIs, regulatory integration

Table 2. Geographic Distribution of Studies (2015–2025)

Region	% of Total Publications	Dominant Themes
North America	34%	Resilience, digital integration, regulatory compliance
Europe	29%	Sustainability, interoperability, hospital case studies
Asia (India, China, SE Asia)	22%	Cost efficiency, accessibility, pharmaceutical logistics
Latin America	8%	Equity of access, public hospital supply chains
Africa	7%	Basic infrastructure challenges, medicine availability

Table 3. Research Design Typologies (2015–2025)

Research Design	% of Studies	Application Context
Case Studies	32%	In-depth hospital or regional supply chains
Simulation/Modeling	26%	Disruption resilience, demand forecasting
Surveys	21%	KPI adoption, stakeholder perceptions
Delphi Studies	12%	Consensus-building on indicator frameworks
Systematic Reviews	9%	KPI synthesis, resilience frameworks

The bibliometric evidence suggests three critical trends. First, the exponential growth from 2019 to 2025 signals the catalytic role of global crises in shaping healthcare logistics scholarship. This reflects a paradigmatic shift from efficiency-centric models toward resilience-oriented approaches. Second, the geographic mapping underscores widening participation from emerging economies, which is vital for ensuring that KPI frameworks are not biased toward high-income contexts. Third, methodological diversity indicates a field in methodological transition: case studies provide necessary contextual grounding, while simulation and Delphi studies point toward more predictive and consensus-driven approaches. This triangulation enhances the robustness of the evidence base, though future work must aim for greater methodological standardization to enable cross-study comparability.

Phase 2: Thematic Categorization of KPIs

Introductory Narrative

The analysis of the 47 retained studies revealed that healthcare supply chain performance is assessed through a wide array of key performance indicators (KPIs). However, these measures can be meaningfully clustered into three overarching domains: financial, managerial, and clinical. This categorization mirrors the multidimensional nature of healthcare, where efficiency cannot be dissociated from quality and patient safety. Financial KPIs track cost control and resource utilization, managerial KPIs assess process and operational effectiveness, while clinical KPIs capture patient-centered outcomes and continuity of care (Langarizadeh et al., 2024; Govindan et al., 2018).

This tri-domain structure not only reflects the complexity of healthcare logistics but also enables a holistic assessment framework. Studies suggest that hospitals relying exclusively on financial indicators risk overlooking clinical quality, while those integrating clinical and managerial metrics demonstrate stronger resilience during crises (Ivanov & Dolgui, 2021; Schneller & Smeltzer, 2022).

Table 4. Categorization of Healthcare Supply Chain KPIs

Domain	Examples of KPIs	Focus of Measurement	Representative Studies
Financial	Inventory turnover ratio, procurement cost, wastage rate, insurance claim processing cost	Tracks cost efficiency, financial sustainability, and resource utilization	Mohammadi et al. (2021); Wang & Zhao (2024)
Managerial	Lead time, supplier reliability, logistics efficiency, order cycle time, stock-out frequency	Assesses operational processes, collaboration, and supply chain visibility	Govindan et al. (2018); Marqués et al. (2019)
Clinical	Patient safety incidents, medication availability, treatment continuity, error reduction	Links supply chain efficiency directly to patient outcomes and care quality	Langarizadeh et al. (2024); Sharma & Bansal (2024)

Table 5. Frequency of KPI Mentions Across Domains (2015–2025)

Domain	Number of Distinct KPIs Identified	Frequency in Literature (%)	Notable Insights
Financial	37	44%	Cost-driven efficiency remains dominant, though sometimes at the expense of service quality.
Managerial	15	32%	Increasing attention to supplier collaboration, digitalization, and real-time logistics.
Clinical	12	24%	Underrepresented but increasingly emphasized post-pandemic as hospitals align supply chains with patient safety.

The clustering of KPIs highlights an imbalance in current research. Financial indicators dominate the discourse, reflecting hospitals' enduring emphasis on cost containment. However, this imbalance risks narrowing the evaluation of healthcare supply chains to fiscal efficiency alone. Managerial indicators, while less numerous, demonstrate growing importance in measuring collaboration and responsiveness, especially with the adoption of digital platforms such as blockchain and predictive analytics. Clinical indicators remain the least developed domain, though their salience has risen sharply in the wake of COVID-19.

The review suggests that integration across domains is crucial. For instance, reducing procurement costs (financial) without considering supplier reliability (managerial) can lead to stock-outs, ultimately compromising patient safety (clinical). Conversely, hospitals that embed clinical KPIs alongside financial and managerial metrics demonstrate higher resilience, particularly during public health crises. Thus, the proposed tri-domain model underscores the necessity of balanced, multi-dimensional performance measurement frameworks for cost-effective yet patient-centered healthcare delivery.

Phase 3: Comparative Analysis and Integration

Cross-regional contrasts

Healthcare supply chain scholarship exhibits clear regional divergences. High-income contexts emphasize resilience and digital integration, while emerging economies prioritize cost efficiency, vendor reliability, and equity of access. For example, Indian public procurement studies highlight vendor non-participation and last-mile delivery failures that distort KPI performance despite digital platforms. Conversely, European and North American systems explore digital twins and predictive KPIs as resilience tools (Ivanov & Dolgui, 2021; Langarizadeh et al., 2024).

Table 6. Cross-regional patterns in healthcare supply chain scholarship

Region	Dominant emphasis	Typical barriers	Policy/organizational levers
North America & Europe	Digital twins, predictive KPIs, supplier risk analytics	Interoperability, legacy IT integration	Enterprise data models, resilience mandates, supplier scorecards
South & East Asia	Procurement integrity, cost control, logistics visibility	Vendor non-participation, weak transport	E-procurement transparency, vendor performance frameworks
Latin America & Africa	Medicine availability, equity of access	Infrastructure constraints, limited data	Donor-linked KPI harmonization, cold-chain investments

Digital vs. traditional practices

Comparisons reveal that digital practices (digital twins, blockchain traceability, AI forecasting) outperform traditional methods (EOQ, manual reordering, paper reconciliation). Digital systems shift measurement from cost-centric KPIs to predictive, event-driven indicators, improving visibility and responsiveness. However, benefits materialize only when managerial and clinical KPIs are integrated, ensuring that cost savings translate into patient outcomes (Govindan et al., 2018; Gaynor et al., 2024).

Table 7. Digital vs. traditional practices—implications for KPI portfolios

Practice type	Techniques	KPI orientation
Digital	Digital twins, AI forecasting, blockchain	From cost & stock levels → to visibility, reliability, responsiveness
Traditional	ABC/EOQ, manual reorder, paper logs	Narrow cost-centric KPIs; lagging detection of shortages/expiries

Gap matrix

Triangulation shows gaps where domains fail to integrate. Cost and clinical outcomes are seldom linked; managerial metrics are under-connected to patient safety; and standardized KPI taxonomies are inconsistently applied.

Table 8. Gap matrix across KPI domains and capability themes

Intersection	What exists	What is missing
Financial × Clinical	Cost per case, wastage rates	Tracing savings → patient outcomes (safety, continuity)
Managerial × Clinical	Lead time, supplier reliability	Standardized links to medication availability, error reduction
Financial × Managerial	Inventory turns, procurement cycle	Equity-adjusted KPIs (peripheral facilities, cold-chain integrity)
Digital × All domains	Proof-of-concept pilots	Consensus KPI sets for digital programs

Integrated KPI Framework

The analysis provides strong evidence for adopting a tri-domain integration model that unites financial, managerial, and clinical key performance indicators into a single evaluative structure. By treating these domains as interdependent rather than isolated measures, healthcare organizations can transform fragmented performance monitoring into a coherent system. The integration of financial indicators ensures cost discipline and efficient resource allocation, while managerial metrics enhance visibility, reliability, and responsiveness across logistics and supplier networks. Clinical KPIs, though less frequently adopted, are essential for linking supply chain efficiency to patient outcomes, such as medication availability, safety, and treatment continuity. Together, these inputs build organizational capabilities that foster resilience against disruptions, improve responsiveness to demand fluctuations, and ensure accountability in service delivery. The resulting outcomes—resilience, cost-effectiveness, and improved patient care—demonstrate the value of a balanced KPI framework that does not privilege financial metrics at the expense of clinical quality. This architecture provides a standardized yet adaptable model that can be applied across diverse healthcare systems, enabling comparability, benchmarking, and strategic alignment of supply chain practices with broader health policy goals.

V. Discussion

Theoretical implications

The findings reaffirm that healthcare supply chains require multidimensional evaluation, challenging earlier frameworks that privileged efficiency alone. Traditional logistics models often emphasize financial KPIs such as cost per unit or inventory turnover, but the tri-domain model highlights the necessity of embedding managerial and clinical indicators alongside financial metrics. This approach supports resilience theory in supply chain management, which posits that organizational adaptability emerges from redundancy, visibility, and responsiveness (Ivanov & Dolgui, 2021). By explicitly linking clinical KPIs to supply chain performance, the study also contributes to the literature on patient-centered operations management, a field where empirical integration has remained limited (Govindan et al., 2018; Langarizadeh et al., 2024). The model thus offers a theoretical bridge between healthcare operations research and supply chain resilience studies.

Managerial implications

For healthcare administrators, the integrated KPI framework provides a practical roadmap for aligning operational efficiency with patient outcomes. Financial KPIs ensure fiscal discipline, yet without managerial and clinical measures, hospitals risk false economies—achieving cost savings at the expense of service quality. The emphasis on visibility, reliability, and responsiveness as intermediate capabilities highlights how managers can translate data into actionable improvements. For instance, digital twin simulations of procurement allow managers to forecast disruptions, while blockchain tools strengthen supplier accountability. Importantly, the tri-domain model guides executives to balance procurement savings against clinical imperatives such as medication safety and treatment continuity. Hospitals that operationalize this balance are better positioned to withstand shocks and maintain service delivery.

Policy implications

The framework also carries significant policy relevance, especially in emerging economies where cost containment is a pressing concern. Governments and regulators can use integrated KPIs to benchmark hospital performance, reduce fraud in procurement, and ensure that financial efficiencies do not compromise equity of access. National e-procurement platforms, for example, could embed standardized KPI reporting that tracks not only transaction costs but also supplier reliability and medicine availability. Such integration strengthens accountability across public healthcare systems and aligns with broader health policy goals such as universal health coverage. Policymakers can further support adoption by mandating consensus-driven KPI sets, encouraging hospitals to move beyond fragmented and inconsistent performance reporting.

Limitations and future research

Although the synthesis advances both theory and practice, certain limitations must be acknowledged. First, the review is bounded by English-language, Scopus-indexed publications, which may exclude region-specific innovations in local journals. Second, while bibliometric mapping provides breadth, it does not capture the full complexity of implementation challenges, especially in low-resource settings. Third, empirical validation of the integrated KPI framework remains limited; longitudinal case studies across different health systems are required to test its applicability in practice. Future research could also explore how digital technologies—AI-driven forecasting, blockchain-enabled traceability, and IoT-enabled cold chains—interact with KPI adoption, potentially creating new categories of indicators. Finally, comparative work across emerging and developed economies could clarify how contextual factors mediate the impact of KPI integration on resilience and patient outcomes.

VI. Conclusion

This study set out to address a critical gap in healthcare operations research: the lack of an integrated framework for measuring supply chain performance. While earlier approaches often privileged financial efficiency, the review demonstrates that hospitals and health systems achieve resilience and patient-centered care only when financial, managerial, and clinical indicators are operationalized together. By clustering 47 peer-reviewed studies into these domains, the analysis generated a tri-domain integration model that reframes fragmented indicators into a coherent architecture.

The findings make three key contributions to scholarly discourse. First, they extend supply chain resilience theory by demonstrating that visibility, reliability, and responsiveness emerge not merely from operational efficiency but from balanced measurement across domains. This theoretical insight bridges healthcare supply chain literature with broader operations management debates on resilient performance systems (Ivanov & Dolgui, 2021; Govindan et al., 2018). Second, the framework introduces a methodological advance by synthesizing diverse empirical indicators into a standardized structure, thereby enabling comparability across hospitals and regions (Langarizadeh et al., 2024). Third, it positions clinical KPIs—often overlooked in logistics studies—at the center of performance assessment, aligning supply chain efficiency with patient safety and continuity of care.

For practitioners, the framework highlights the managerial risks of relying solely on financial measures. Hospitals that optimize procurement costs without tracking supplier reliability or patient safety risk short-term savings that undermine long-term resilience. By adopting integrated KPIs, administrators can align inventory control and logistics operations with clinical imperatives, ensuring both fiscal discipline and service quality. Digital tools such as blockchain, AI-enabled forecasting, and digital twins provide enabling infrastructure, but their value is contingent upon embedding them within a KPI system that captures patient outcomes alongside costs.

From a policy perspective, integrated KPI frameworks offer regulators a powerful mechanism for benchmarking healthcare performance. In emerging economies, embedding standardized KPI reporting into national e-procurement systems could improve transparency, reduce fraud, and enhance equitable access to medicines. In high-income contexts, policymakers can use the framework to mandate resilience reporting and ensure interoperability across digital platforms. In both settings, consensus-driven indicator sets—developed through Delphi or expert panels—can mitigate the current inconsistency in KPI adoption.

The study is not without limitations. The reliance on published, English-language sources may omit locally grounded innovations, while the absence of longitudinal case validation restricts insight into practical implementation challenges. Nevertheless, these limitations suggest clear avenues for future research. Longitudinal case studies, cross-country comparisons, and empirical tests of digital KPI integration would further validate and refine the proposed framework.

In conclusion, integrating financial, managerial, and clinical KPIs into a tri-domain framework provides healthcare organizations with a balanced and actionable approach to performance measurement. By fostering visibility, reliability, and responsiveness, this architecture enables hospitals to achieve resilience, cost-effectiveness, and improved patient outcomes. In doing so, it contributes not only to the academic literature but also to the practical transformation of healthcare supply chains into systems that are both efficient and patient-centered.

Highlights

- **Tri-domain KPI integration:** This study introduces a framework that unites financial, managerial, and clinical indicators, moving beyond cost-centric approaches to performance measurement in healthcare supply chains. The model underscores the interdependence of efficiency, resilience, and patient outcomes.
- **Resilience through capabilities:** By linking KPIs to intermediate capabilities—visibility, reliability, and responsiveness—the framework explains how hospitals can translate measurement into strategic resilience. This perspective enriches supply chain resilience theory with patient-centered dimensions.
- **Cross-regional insights:** Bibliometric mapping reveals distinct emphases across regions, with high-income countries prioritizing digital resilience and emerging economies focusing on affordability and access. The integrated framework enables benchmarking across these diverse contexts.
- **Policy and managerial relevance:** The study highlights how regulators and administrators can embed standardized KPI sets into procurement, reporting, and digital platforms. Doing so enhances transparency, reduces inefficiencies, and ensures that financial savings do not compromise clinical quality.

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