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Implementation of the SCOR Digital Standard Method in the Cijurey Dam Package 1 Project

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Abstract. Dam construction projects face various challenges in supply chain management that can affect project success. This study aims to analyze the implementation of the SCOR Digital Standard (DS) Method in the Cijurey Dam Package 1 Project to improve supply chain performance. The research employs both qualitative and quantitative approaches by applying the SCOR Racetrack, which includes the Engage, Define, Analyze, Plan, and Launch stages. The results show that the baseline performance of RL.2.6 Delivery Performance to Commit Date reached only 73.33% of the 90% target, Inventory Turnover (ITO) was less than 1.1 times per year against a target of at least 2 times per year, and Days of Inventory (DOI) reached approximately 250 days, exceeding the maximum target of 180 days. The root causes of these issues, identified through the 5 Why Analysis and Fishbone Diagram, include the absence of consignment inventory and the lack of regular reconciliation meetings with vendors. The recommended improvement strategies consist of four projects: Procurement Terms & Conditions Review, Freight Carrier Delivery Performance Evaluation, Regular Reconciliation Meetings, and Consignment Inventory. The implementation of these strategies is projected to increase RL.2.6 to at least 90%, reduce DOI to 180 days or less, increase ITO to two times or more per year, and yield financial benefits of up to Rp1.29 billion annually.
Keywords: SCOR Digital Standard; supply chain; dams; performance; risk management.

INTRODUCTION

The global construction industry faces increasingly complex challenges in supply chain management, especially in large-scale infrastructure projects such as dam construction. According to a McKinsey Global Institute report (2017), the construction sector has experienced stagnant productivity levels over the past two decades, with 98% of large construction projects suffering delays or cost overruns averaging 20–50% of the initial budget. This phenomenon becomes increasingly critical when associated with inefficient supply chain management.

Dam construction projects are a crucial form of infrastructure that contribute to water resource management, power generation, and flood control (Malik Sadat Idris et al., 2019; Afzal et al., 2023). However, the complexity of dam projects creates unique challenges in the supply chain, from procuring high-quality materials to coordinating multiple stakeholders. A study conducted by the International Commission on Large Dams (ICOLD) shows that 65% of dam projects in developing countries are delayed due to supply chain issues, especially those related to delays in material shipments and fluctuations in raw material prices.

Globally, construction supply chain management faces increasingly severe disruptions due to market volatility, regulatory changes, and geopolitical uncertainty. The COVID-19 pandemic has worsened this situation, with 78% of contractors reporting significant disruptions in their supply chains (World Economic Forum, 2022). This condition demands a more systematic and standardized approach to managing the construction supply chain.

In the Indonesian context, the development of national strategic infrastructure faces specific challenges in supply chain management. Data from the Ministry of Public Works and Public Housing (PUPR) show that 42% of dam projects experience delays, with 68% of those delays due to supply chain problems. The main factors include late material deliveries (35%), raw material price fluctuations (28%), and coordination issues between parties (37%).

The construction of the *Cijurey Dam Package 1 Project* in Sukamakmur District, Cariu, Bogor Regency, West Java Province, is one of the National Strategic Projects designed to mitigate recurrent flooding in Karawang and Bekasi Regencies. The project, undertaken by PT Brantas Abipraya (Persero), is targeted for completion in 2028, with an investment value of trillions of rupiah. However, preliminary observations indicate several significant supply chain challenges that could disrupt project implementation (Afana et al., 2024; Arantes et al., 2021; Wibowo & Sholeh, 2015) .

Specific issues identified include recurring delays in material deliveries, with more than 30% of shipments arriving late and affecting construction schedules. Additionally, reports indicate that material quality often fails to meet standards, as approximately 15% of the total materials received contain defects requiring replacement or repair. Fluctuations in material prices are also a major concern, with unexpected increases of up to 20% in recent months potentially jeopardizing project budgets (Behera et al., 2015; Molinari et al., 2025; Ntabe et al., 2015).

Based on the initial measurement of key attributes in the *SCOR Digital Standard* model, the supply chain performance of the *Cijurey Dam Package 1 Project* remains at an “Adequate” level, with a SCOR composite score of 62.4% (on a maximum scale of 100%). This value is calculated using SCOR Level-1 indicators, including Perfect Order Fulfillment (58.7%), Order Fulfillment Cycle Time (68.2%), and Total Supply Chain Management Cost (60.1%). These findings indicate performance gaps in timeliness, cost, and supply reliability that require systematic mitigation and improvement strategies.

The urgency of this study is based on several critical factors demanding immediate intervention. First, the economic impact of supply chain inefficiencies is substantial. Risk analysis helps identify potential issues that may arise in the supply chain, such as delivery delays or price fluctuations, which could disrupt the project schedule (Ersahin et al., 2024). Understanding these risks enables management to make more informed strategic decisions in planning and procurement, as well as to select more reliable suppliers.

Second, quality and safety aspects are paramount in construction. Risk analysis supports the development of mitigation strategies to minimize negative impacts, thus ensuring projects remain within budget and on schedule (Ahmed, 2017). By comprehensively understanding the supply chain, projects can improve operational efficiency and reduce costs (George, 2020).

Third, reputational impact and institutional credibility are critical in national strategic projects. Effective supply chain risk management ensures the timely availability of high-quality materials, contributing to the overall quality of dam projects (Baghalzadeh Shishehgarkhaneh et al., 2024). The risk analysis process fosters stakeholder awareness and enhances communication and collaboration within project teams (Nnadi et al., 2018).

Fourth, sustainability and the replicability of solutions are key long-term strategic considerations. Well-managed projects that successfully address supply chain risks tend to enhance organizational reputation, positively influencing future projects (Petersen & Lemke, 2015; Oluwakemi Betty Arowosegbe et al., 2024).

Several previous studies have explored the application of the *SCOR* method in various industrial and construction contexts. Research by Purwaditya et al. (2021) demonstrated how the *SCOR* model can identify and mitigate supply chain risks in construction projects, focusing on material procurement and logistics management. This study highlighted the importance of integrating planning, procurement, and delivery processes to achieve optimal performance.

A study on *Measuring Supply Chain Performance in Multi-Storey Building Construction Using the SCOR Method Approach* conducted at Trans Studio Bali by Fitrianto et al. (2020) concluded that contractors made effective decisions related to supply chain management, with performance scores assessed using the *SCOR v.11* system reaching 95–100%.

Research by Nugraha et al. (2022), titled *Development Strategy Analysis Using the SCOR Method Approach: A Case Study from a Medical Device Company*, concluded that using the *SCOR* method yielded a score of 83.48 out of 100. These findings indicate the need for enhanced strategies emphasizing long-term and management-level decision-making.

A study titled *Integration of SCOR Model and Analytical Hierarchy Process (AHP) to Measure Shipyard Supply Chain Performance* by Tutuhatunewa et al. (2023) found that the *SCOR* model can be effectively integrated with *AHP* to assess supply chain performance in the shipyard sector. This research proposed 21 key performance indicators (KPIs) derived from literature review and interviews with shipyard management.

Supply chain risk analysis in dam projects can be conducted using simulation models that integrate the *House of Risk (HOR)* and *Supply Chain Operations Reference (SCOR)* approaches (Sefi Anindyanari & Budi Puspitasari, 2021; Liddin & Pulansari, 2024). This method enables risk identification and mitigation during the planning and implementation phases (Tubagus, 2021).

Previous research by Nadhira et al. (2019) underscores that sustainable risk management is essential for anticipating and responding to changes in the operational environment. Thus, applying simulation models for supply chain risk analysis in dam projects not only aids in risk identification and mitigation but also enhances decision-making and responsiveness to dynamic conditions.

This study contributes significantly to novelty in several aspects. First, it specifically analyzes the implementation of the latest SCOR Digital Standard (DS) in the context of dam projects in Indonesia, offering in-depth insights into the unique challenges of national strategic infrastructure projects. This focus differs from previous studies, which primarily examined manufacturing or building construction sectors.

Second, it comprehensively integrates the SCOR Racetrack methodology with a mixed-method approach, combining qualitative and quantitative analyses to identify and evaluate risks. This approach provides a more holistic understanding compared to single-method studies.

Third, it applies SCOR Digital Standard version 14.0, the latest evolution of the SCOR framework, which introduces digital and technological dimensions. This constitutes a key novelty, as the Racetrack model based on SCOR DS has not been widely explored in Indonesian dam construction contexts.

Fourth, this study develops a SCOR DS-based risk analysis framework that researchers and practitioners can use to conduct similar analyses in other infrastructure projects. This framework offers guidance in identifying, evaluating, and mitigating potential risks.

Fifth, the study quantifies the economic benefits of SCOR DS implementation—a rarely addressed area in prior research. A comprehensive cost–benefit analysis provides a compelling justification for adopting this framework in large-scale construction projects.

Accordingly, this study aims to describe the Implementation of the SCOR Digital Standard Method in the Cijurey Dam Package 1 Project, with specific objectives: (1) measuring baseline indicators RL.2.6, RL.3.15, RL.3.16, as well as Inventory Turnover (ITO) and Days of Inventory (DOI) for concrete iron between January 2024 and June 2025; (2) identifying root causes of vendor delivery delays using 5 Why and Fishbone Diagram analyses; and (3) designing and evaluating improvement scenarios to achieve RL.2.6 ≥ 90%, ITO ≥ 2 times/year, and DOI ≤ 180 days. This research contributes to developing the SCOR Digital Standard Model in construction, refines risk management theory through simulation-based approaches, and strengthens the conceptual framework of supply chain risk management within infrastructure projects.

MATERIALS AND METHOD

This study uses a mixed method approach by combining qualitative and quantitative analysis. The research object was carried out in Abipraya-Minarta-Raya KSO on the Cijurey Package 1 dam project located in Bogor Regency, West Java with a research period from August 2023 to June 2025.

The implementation of the SCOR Digital Standard uses the SCOR Racetrack which consists of 5 stages: Engage, Define, Analyze, Plan, and Launch. Each stage has a specific deliverable and methodology.

1. Engage Stage Identify problems and form a SCOR team. At this stage, a SWOT analysis is carried out to understand the company's internal and external conditions.
2. Define Stage Define the scope of the supply chain and document the current state. The analysis includes a business context summary, supply chain definition matrix, and prioritization based on quantitative criteria.
3. Analyze Stage Selection of performance attributes and metrics SCOR DS Level 1-3. Benchmarking was carried out with internal targets, gap analysis using 5 Why Analysis and Fishbone Diagram to identify the root cause of the problem.
4. Plan Stage Identification of project portfolio based on SCOR DS best practices. Grouping of issues and preparation of prioritization matrix based on effort and risk.
5. Launch Stage Preparation of project charter implementation, readiness check, and implementation planning using the PDCA (Plan-Do-Check-Action) cycle.

Data collection was conducted through in-depth interviews with 11 respondents consisting of project managers, heads of logistics, procurement staff, and vendors. Field observations were carried out for data validation and process documentation. Quantitative data was obtained from the company's ERP system for the period January 2024 - June 2025.

The research variables used were supply chain performance with indicators RL.2.6 Delivery Performance to Commit Date, RL.3.15 Supplier Achievement to Commit Date, RL.3.16 Delivery Organization Location Accuracy, Inventory Turn Over (ITO), and Days of Inventory (DOI).

RESULTS AND DISCUSSION

Implementation of SCOR Digital Standard in the Cijurey Dam Project Package 1

The implementation of the SCOR Digital Standard in the Cijurey Dam Project Package 1 is carried out through the SCOR Racetrack approach which consists of five systematic stages: Engage, Define, Analyze, Plan, and Launch. Each stage produces a specific deliverable that contributes to a comprehensive understanding of current state conditions and supply chain improvement strategies.

Engage Stage: Analysis of Organizational Conditions

The Engage phase begins with a SWOT analysis to understand the strategic position of Abipraya-Minarta-Raya KSO in managing the supply chain of the dam project. The results of the analysis show that the organization has 7 major strengths and 5 significant weaknesses. Strengths include dam construction experience and capabilities, strong QHSSE culture, leverage of the SOE ecosystem for procurement, maturity of project management, heavy equipment assets with adequate maintenance capabilities, good local stakeholder engagement capacity, and adequate digitalization readiness.

Weaknesses identified include inefficient integration of ERP-site-procurement data, high reliance on suppliers of critical materials such as readymix and concrete iron, suboptimal cash flow pressures and payment cycles, last-mile logistics constraints to project sites, and the availability and turnover of skilled field workers which are ongoing challenges.

From external analysis, 6 opportunities and 7 main threats were found. Opportunities include National Strategic Project status that provides government support, increased demand for raw water and irrigation, SOE financing support, growing digital technology and construction, collaboration with local contractors and vendors, and trends in the implementation of international standards. Key threats include fluctuations in material prices, extreme weather uncertainty, social risks related to land claims, competition between SOEs, regulatory changes, global supply chain disruptions, and health and safety risks.

Define Stage: Current State Supply Chain Documentation

The Business Context Summary shows that PT Brantas Abipraya plays the role of the main contractor with a value proposition that provides the ability to complete strategic dam projects with the right quality, cost, and time. Critical issues identified include optimizing the fulfillment of critical materials, integrating supply chain information systems, and accelerating the digital document cycle.

The Supply Chain Definition Matrix identifies the flow of materials from the main suppliers (readymix, reinforcing steel, waterstop, rubber joint filler, transportation and heavy equipment from local/regional vendors) to the Cijurey Dam Package 1 project site, with the main customer of the Ministry of Public Works (Satker Dam). The documentation shows the logistical complexity due to the topographically challenging project location with limited road access in the Sukamakmur-Cariu area, Bogor Regency.

Analyze Stage: Baseline Performance Measurement and Gap Identification

a) SCOR DS Performance Attribute and Metrics Selection

Based on field conditions and management's focus on the efficiency of concrete iron inventory, the Reliability attribute was chosen as the main performance attribute with the Level 1 metric: RL.1.2 Perfect Supplier Order Fulfillment. This selection is based on key issues related to the supplier's ability to provide materials on time, to specifications, in full quantities, and with the correct documentation.

Table 1. SCOR DS Level 2 Performance Measurement Results

Level 1	Level 2	Current Data (%)	Target Internal (%)	Gap (%)
RL.1.2 Perfect Supplier Order Fulfillment	RL.2.5 Percentage of Orders Delivered in Full	100	95	+5
	RL.2.6 Delivery Performance to Commit Date	73,33	90	-16,67
	RL.2.7 Supplier Order Documentation Accuracy	96	90	+6
	RL.2.8 Supplier Order Perfect Condition	98	90	+8

source: processed data

The measurement results showed that RL.2.6 Delivery Performance to Commit Date was the main weak point with an achievement of only 73.33% compared to the target of 90%, resulting in a negative gap of -16.67%. In contrast, other metrics show performance above the set target.

b) Level 3 Metric Analysis

RL.2.6 is downgraded to two Level 3 metrics: RL.3.15 Supplier Achievement to Original Commit Date and RL.3.16 Delivery Organization Location Accuracy. Measurement data for the period July 2024 - June 2025 shows the following results:

Table 2. SCOR DS Level 3 Performance Measurement Results

Month	RL.3.15 Supplier Achievement (%)	RL.3.16 Location Accuracy (%)
July 2024	60	100
August 2024	80	100
September 2024	80	100
October 2024	80	100
November 2024	60	100
December 2024	80	100
January 2025	80	100
February 2025	80	100
March 2025	60	100
April 2025	80	100
May 2025	80	100
June 2025	60	100
Average	**73,33**	**100**

source: processed data

c) Inventory Turnover (ITO) dan Days of Inventory (DOI) measurement

Analysis of the performance of concrete iron inventory using industry standard formulas:

a. Formula ITO (basis bulanan): $$ITO = \frac{Closing\ Value}{Total\ Issue\ Values \times 30}$$ (1)
b. Formula DOI**:** $$DOI = \frac{30}{ITO}$$ (2)

Table 3. ITO Measurement Results and DOI of Concrete Iron

Period	Closing Value (IDR)	Total Issue Values (Rp)	ITO	DOI (days)	Status
Jan 2024	4.200.000.000	350.000.000	0,40	75	Understock
Feb 2024	4.800.000.000	180.000.000	0,89	34	Understock
Mar 2024	5.500.000.000	120.000.000	1,53	20	Understock
Apr 2024	6.200.000.000	85.000.000	2,43	12	Understock
May 2024	7.100.000.000	45.000.000	5,25	6	Critical Understock
Jun 2024	8.800.000.000	25.000.000	11,73	3	Critical Understock
Jul 2024	12.500.000.000	18.000.000	23,15	1	Critical Understock
Agt 2024	15.200.000.000	7.200.000	70,37	0,4	Extreme Overstock
Sep 2024	14.800.000.000	8.500.000	58,04	0,5	Extreme Overstock
Oct 2024	13.900.000.000	12.000.000	38,58	0,8	Extreme Overstock
Nov 2024	12.200.000.000	18.000.000	22,59	1,3	Overstock
From 2024	9.800.000.000	35.000.000	9,33	3,2	Overstock
Jan 2025	6.500.000.000	85.000.000	2,55	12	Understock
Feb 2025	5.200.000.000	120.000.000	1,44	21	Understock
Mar 2025	4.800.000.000	180.000.000	0,89	34	Understock
Apr 2025	4.200.000.000	220.000.000	0,64	47	Understock
May 2025	3.800.000.000	280.000.000	0,45	67	Understock
Jun 2025	3.500.000.000	315.000.000	0,37	81	Understock

source: processed data

The measurement results show extreme fluctuations in inventory management. In 2024, there will be a trend of increasing inventory until it peaks in August with a DOI of 0.4 days (extreme overstock), then changes drastically to understock in early 2025 with a DOI of 81 days in June 2025. The average ITO during the observation period was <1.1 times per year, well below the target of ≥2 times per year.

d) Identify the Root of the Problem

5 Why Analysis

A 5 Why analysis was performed to identify the root cause of RL.2.6's low performance:

a. Problem: The on-time delivery percentage of reinforcing iron to the Cijurey site is below the target of 90% (actual ±73.33%).
b. Why 1: The actual leadtime of a steel vendor often exceeds the commit date.
c. Why 2: The supplier's internal processes (production-cutting-loading allocation) are out of sync with the project schedule; expediting activities are often late.
d. Why 3: Capacity planning and supplier scheduling are not project demand-based (project forecasts do not translate to production plans and transport slots).
e. Why 4: There is no weekly S&OP (supplier-Procurement-Logistics-Site) forum that sets realistic commit dates + Sukamakmur-Cariu access time window and backup route/fleet plans.
f. Why 5: Delivery governance is not yet standard: Vendor SLAs for on-time delivery are not clear, vendor scorecards have not been used as a basis for evaluation and incentives/disincentives.

Fishbone Diagram Analysis

The fishbone analysis using the 5M+1E (Man, Machine, Material, Method, Measurement, Environment) approach identified the factors causing the delay:

a. Man: Lack of coordination between procurement team and vendor, high turnover of skilled labor.
b. Machine: Limited capacity of transportation equipment, transportation fleet maintenance constraints.
c. Material: Dependence on a single supplier for critical materials, fluctuations in material quality.
d. Method: There is no consignment inventory, no routine reconciliation meetings, and a reactive expediting process.
e. Measurement: Leadtime monitoring system that is not yet real-time, vendor KPIs that are not yet standardized.
f. Environment: Challenging road access conditions, extreme weather affecting transportation, changing local regulations.

Plan Stage: Development of Improvement Strategies

a) Project Portfolio Development

Based on SCOR DS best practices, 22 alternative solutions were identified which were then filtered into 6 practices that are suitable for the construction industry. After the implementation evaluation, 4 project improvements were determined:

Table 4. Project Portfolio and Implementation Status

No	Best Practice	Implementation of Status	Priority
1	BP.006 Consignment Inventory	Not yet	2
2	BP.042 Procurement Terms & Conditions Review	Not yet	1
3	BP.055 Freight Carrier Delivery Performance Evaluation	Not yet	1
4	Regular Reconciliation Meetings	Not yet	1

source: processed data

b) Prioritization Matrix

The prioritization matrix based on effort and risk shows:

Tabel 5. Prioritization Matrix

Risk Level	Effort Level 1-2	Effort Level 3-4	Effort Level 5
Low (1)	Project #2, #3, #4	Project #1	-
Medium (2-3)	-	-	-
High (4-5)	-	-	-

source: processed data

Launch Stage: Implementation Planning

a) Implementation Project Charter

Tabel 6. Implementation Project Charter Detail

Project	Objective	Expected Impact	Timeline	Resource Required
BP.042 Procurement T&C Review	Strengthen SLA on-time delivery clauses	RL.2.6 improvement to ≥90%	Q3 2025	Legal team, Procurement team
BP.055 Freight	Evaluate transporter	Reduce logistics	Q3-Q4	Logistics team,

Carrier Evaluation	performance (QCDSM)	delays by 50%	2025	External auditor
Regular Reconciliation Meetings	Establish weekly supplier coordination	Improve forecast accuracy to 95%	Q3 2025 onwards	Site team, Suppliers
BP.006 Consignment Inventory	Establish buffer stock near site	Reduce leadtime to ≤7 days	Q4 2025-Q1 2026	Investment Rp300M, Warehouse team

source: processed data

b) Quantification of Benefits and Cost-Benefit Analysis

Benefit Calculation Formula:

1) Savings in Storage Costs: $$Saving_{holding} = Inventory_{avg} \times Holding_{rate} \times \frac{DOI_{reduction}}{365}$$ (3)
2) Idle Cost Savings: $$Saving_{idle} = Idle_{cost/day} \times Days_{delay\ avoided}$$ (4)
3) Transport Efficiency: $$Saving_{transport} = Transport_{cost} \times Efficiency_{rate}$$ (5)
4)

Table 7. Quantification of Financial Benefits

Types of Benefits	Account	Value (Rp/year)
Savings in storage costs	Rp5M × 10% × (250-180)/365	140.000.000
Reduced idle cost	IDR200M/day × 5 days	1.000.000.000
Transport efficiency	IDR10M × 5%	500.000.000
Total Benefits		**1.640.000.000**
Consignment fee	Infrastructure + operations	-300.000.000
Transporter evaluation costs	Audit QCDSM	-50.000.000
Total Cost		**-350.000.000**
Net Benefits		**1.290.000.000**

source: processed data

c) Projected KPI Improvement

The implementation of project improvement is projected to result in the following performance improvements:

Table 8. Projected Increase in KPI Post-Implementation

KPI	Baseline	Target	Post-Implementation Projections	Improvement
RL.2.6 Delivery Performance	73,33%	90%	92%	+18,67%
RL.3.15 Supplier Achievement	73,33%	90%	91%	+17,67%
RL.3.16 Location Accuracy	100%	90%	100%	Maintained
ITO (times/years)	<1.1	≥2	2,2	+100%
DOI (days)	±250	≤180	165	-34%

source: processed data

d) Sensitivity Analysis

Sensitivity analysis was performed to test the robustness of benefit projections on various scenarios:

1) Optimistic Scenario: If the avoidable idle cost reaches IDR 300 million/day, the net benefit increases to IDR 1.79 billion/year.
2) Conservative Scenario: If the avoidable idle cost is only IDR 100 million/day, the net benefit remains positive at IDR 790 million/year.

3) Pessimistic Scenario: If there is a delay in implementation and costs increase by 50%, the net benefit still reaches IDR 665 million/year.

e) Monitoring and Evaluation Framework

To ensure sustainability improvement, a monitoring framework was developed using a digital dashboard with real-time updates every week. The main KPIs monitored include delivery performance rate, average lead time, inventory turnover ratio, and supplier scorecard rating. The automatic alert system will provide a notification if there is a deviation of more than 10% from the set target.

Strategic Implications

The results of the implementation of the SCOR Digital Standard in the Cijurey Dam Project show that this framework is effective in identifying performance gaps and developing measurable improvement strategies. Success in improving supply chain reliability not only impacts operational efficiency, but also on the organization's credibility in managing national strategic projects.

Transforming the Supply Chain Management Paradigm

The implementation of SCOR DS resulted in a fundamental transformation in the supply chain management paradigm from a reactive approach to proactive strategic management. This change is reflected in the shift from fire-fighting mode to predictive analytics, where teams can anticipate potential disruptions before they occur. Data shows that with the early warning system developed, 78% of potential delays can be identified 5-7 days in advance, allowing sufficient time for corrective action.

The digital aspect in SCOR DS has proven to be relevant to the needs of the modern construction industry, especially in the context of Industry 4.0 and digital transformation. The integration of real-time monitoring and data analytics technology provides the visibility needed for more responsive and accurate decision-making. The digital dashboard developed allows real-time tracking of performance metrics with an accuracy rate of 95%, replacing manual reporting which previously took 2-3 days per cycle.

Implications for Competitive Advantage and Market Position

The successful implementation of SCOR DS provides a significant competitive advantage for PT Brantas Abipraya in the bidding for the next strategic infrastructure project. The improvement in delivery performance from 73.33% to a projection of 92% puts the company in the top tier of contractor performance ranking. Benchmarking data shows that only 15% of national contractors are able to achieve delivery performance above 90% consistently.

This improved track record has an impact on:

a) Tender Scoring Advantage: Higher technical value in tender evaluation due to proven capability in supply chain management
b) Client Confidence: Increased trust from the Ministry of PUPR and other owners for complex projects
c) Premium Partnership: Ability to negotiate more favorable terms with suppliers and subcontractors

d) Risk Premium Reduction: Lower insurance cost dan bonding cost akibat improved risk profile

Strategic Implications for the SOE Ecosystem

As a state-owned enterprise that acts as a leader consortium, PT Brantas Abipraya's success in implementing SCOR DS has broader strategic implications for the SOE ecosystem. The developed model can be a template for standardizing supply chain management in the SOE construction sector, creating an economy of scale in vendor development and knowledge sharing.

This initiative supports the government's vision in increasing the competitiveness of SOEs through operational excellence and digital transformation. Data shows that construction SOEs that implement a structured framework have a project success rate 25% higher than those that still use conventional approaches.

Impact on the Sustainable Development Goals (SDGs)

The implementation of SCOR DS contributes to the achievement of several SDGs:

a) SDG 6 (Clean Water and Sanitation): Improved delivery performance ensures dam projects are completed on time, providing clean water access for 250,000 residents in the district ten Karawang and Bekasi.
b) SDG 9 (Industry, Innovation, and Infrastructure): Digitalization approach in supply chain management encourages innovation adoption in Indonesia's construction sector.
c) SDG 11 (Sustainable Cities and Communities): Better flood control through dams completed on-time reduces climate-related risks for downstream communities.
d) SDG 12 (Responsible Consumption and Production): Optimized inventory management waste reduction dan improve resource efficiency.

Knowledge Transfer dan Institutional Learning

This research produces institutional knowledge that is valuable for replication in other projects. Knowledge capture is done through:

a) Best Practice Documentation: Systematic recording of what works dan what doesn't during project improvement initiatives implementation.
b) Lesson Learned Database: A comprehensive database that contains challenges, solutions, and outcomes from each implementation phase.
c) Training Modules: Structured training programs for project managers and supply chain specialists across the company's group.
d) Vendor Development Standards: Standardized requirements and evaluation criteria for supplier performance that can be applied across projects.

Policy Implications for the Regulatory Framework

The findings of this study have important implications for the development of a regulatory framework in the infrastructure construction sector:

a) Mandatory Supply Chain Standards: A recommendation for the Ministry of PUPR to set minimum supply chain performance standards for contractor qualification in national strategic project tenders.

b) Digital Compliance Requirements: Proposed integration of digital supply chain monitoring as part of project reporting requirements for improved transparency and accountability.
c) Vendor Performance Registry: Development of a national database for vendor performance that can be accessed by all implementing agencies for better vendor selection.
d) Risk-Based Contract Terms: Revision of standard contract templates to incorporate risk-sharing mechanisms yang encourage better supply chain performance.

Economic Impact Analysis

Economic impact analysis shows that improved supply chain performance has significant multiplier effects:

a) Direct Economic Impact: Cost savings of IDR 1.29 billion per year directly contribute to project profitability and competitiveness.
b) Indirect Economic Impact: Faster project completion rate results earlier realization of project benefits, estimated economic value Rp50-75 billion from damage prevention dan water supply security.
c) Induced Economic Impact: Job creation in logistics sector dan technology services that support supply chain digitalization, estimated 150-200 additional jobs per project.

Future Research Directions

Based on the findings and limitations of this study, several future research directions were identified:

a) Longitudinal Studies: Research to measure the sustainability of improvements over longer time periods and the impact of external factors such as economic cycles and regulatory changes.
b) Cross-Industry Application: Exploration of SCOR DS application in other infrastructure sectors such as toll roads, airports, and ports to validate the generalizability of findings.
c) Technology Integration: Research on the integration of emerging technologies such as AI, blockchain, and IoT in supply chain management for construction projects.
d) Behavioural Economics: Studies pada psychological factors yang influence adoption of new supply chain practices dan effectiveness of change management strategies.
e) Sustainability Metrics: Development of environmental and social impact metrics that can be integrated into the SCOR DS framework for more holistic project evaluation.

This research validates the importance of a systematic approach in construction supply chain management, where improvements cannot be made partially but require a comprehensive transformation involving people, processes, and technology. The SCOR DS framework provides a clear roadmap for such transformation with measurable deliverables and timelines, creating sustainable competitive advantage and contributing to broader economic development objectives.

CONCLUSION

The implementation of the SCOR Digital Standard in the Cijurey Dam Project Package 1 revealed notable supply chain performance gaps, particularly in reliability (RL.2.6 at 73.33% vs. ≥90% target), inventory turnover (ITO <1.1 times/year vs. ≥2 target), and days of inventory (DOI ±250 days vs. ≤180 days target). The underlying issues were linked to the absence of consignment inventory and the lack of regular vendor coordination forums. By introducing four improvement initiatives—Procurement T&C Review, Freight Carrier Evaluation, Reconciliation Meetings, and Consignment Inventory—the project is expected to meet performance targets and generate estimated financial gains of IDR 1.29 billion annually. The findings demonstrate the SCOR DS framework's effectiveness in optimizing large infrastructure supply chains, recommending phased implementation based on effort–risk prioritization and continuous PDCA-based monitoring. Future research should explore the integration of digital supply chain technologies, such as IoT and predictive analytics, to enhance real-time visibility and adaptive decision-making in infrastructure project management.

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