

From Catch to Consumer: A Process-Centric Model for Resilient Fisheries Value Chains

M. Arif Kamal¹, Aunur Rofiq Mulyarto² Usman Effendi³

^{1,2,3}Faculty of Agricultural Technology, University of Brawijaya, Malang, Indonesia

Received:

November 18, 2025

Revised:

January 12, 2026

Accepted:

January 29, 2026

Published:

February 24, 2026

Corresponding Author:

Author Name*:

M. Arif Kamal

Email*:

m.arif.kamal@ub.ac.id

DOI:

10.63158/journalisi.v8i1.1413

© 2026 Journal of Information Systems and Informatics. This open access article is distributed under a (CC-BY License)



Abstract. Capture fisheries value chains are highly fragmented and time-sensitive, with multiple stakeholders and perishable products creating persistent challenges for quality management, traceability, and resilience. Many improvement initiatives prioritize digital technologies, yet benefits often remain limited when tools are not embedded in day-to-day business processes. This study proposes a process-centric framework that integrates Porter's Value Chain with Business Process Model and Notation (BPMN) to diagnose and redesign capture fisheries workflows. Using a case-based approach, As-Is BPMN models are developed across key actors—fishing vessels, landing/auction sites, processors, and distributors—to identify process gaps, information discontinuities, and subjective decision points that weaken end-to-end traceability and quality assurance. Building on these insights, a To-Be process architecture is designed that embeds standardized identifiers, explicit decision logic, quality checkpoints, and traceability controls directly into operational workflows. The findings indicate that process-oriented redesign strengthens information continuity, accountability, and compliance readiness, shifting traceability from a retrospective reporting obligation to an operational management mechanism. Methodologically, the study demonstrates how Porter's Value Chain can function as a process landscape and how BPMN connects strategic value creation to execution. Practically, the framework offers actionable guidance to improve governance and resilience in capture fisheries value chains.

Keywords: Capture fisheries; Supply chain resilience; Traceability; Business process management; BPMN

1. INTRODUCTION

Capture fisheries supply chains play a strategically important role in food security, coastal livelihoods, and regional economic development, yet they remain among the most structurally fragmented and operationally challenging agri-food systems. These supply chains involve multiple heterogeneous actors—including fishers, landing sites, processors, distributors, and retailers—operating under varying regulatory environments and uneven technological capabilities [1], [2]. Such fragmentation weakens coordination and governance, adversely affecting efficiency, collaboration, and overall supply chain performance [3]. These challenges are further amplified by the sector's strong dependence on environmental and ecological conditions, making capture fisheries particularly vulnerable to climate variability and ecosystem dynamics that directly influence supply continuity and operational stability [4]. Given the high perishability of fish products, delays or inefficiencies in handling, processing, and distribution can rapidly lead to quality degradation, economic losses, and erosion of market trust [5], [6].

From a governance and operational perspective, persistent weaknesses in data integration, visibility, and traceability remain central constraints in capture fisheries supply chains. Manual and non-standardized data recording practices generate fragmented and unreliable information flows, limiting stakeholders' ability to monitor product quality, inventory status, and regulatory compliance in real time [7]. Although digital technologies such as blockchain, Internet of Things (IoT), and electronic logbooks are increasingly promoted within sustainability and fisheries management agendas, empirical evidence indicates that their impacts are often constrained when implemented without corresponding process restructuring and institutional coordination [8], [9]. Technology-focused interventions alone frequently fail to address the underlying causes of disruption, which are rooted in systemic challenges such as regulatory complexity, limited organizational capacity, and weak inter-organizational coordination [10], [11].

The academic literature has extensively examined traceability and quality management in fisheries supply chains, particularly in relation to sustainability objectives, fraud prevention, and the mitigation of illegal, unreported, and unregulated (IUU) fishing [11]. Recent studies emphasize the potential of blockchain and related digital technologies to enhance transparency and accountability [12][13] [14]. However, this body of work remains

predominantly system-centric, treating traceability as an isolated technological artifact rather than as an integral component of end-to-end operational [15]. Empirical observations from fishing ports and landing sites further reveal that poorly structured workflows and continued reliance on manual record-keeping significantly undermine the practical effectiveness of traceability systems, regardless of technological sophistication [16][17]. These findings highlight a clear research gap: the lack of process-oriented analytical frameworks that systematically connect governance objectives, traceability mechanisms, and operational execution in capture fisheries supply chains.

To address this gap, the objective of this study is to develop and apply a process-centric analytical framework for capture fisheries supply chains. Specifically, the study aims to: (I) structure capture fisheries activities using Porter's Value Chain as a strategic process landscape; (II) translate value-creating activities into interconnected end-to-end operational processes using Business Process Model and Notation (BPMN); and (III) identify process gaps, information discontinuities, and coordination failures that constrain traceability, quality control, and supply chain resilience.

The main contributions of this research are threefold. First, it advances the fisheries supply chain literature by shifting the analytical focus from technology-centric traceability systems toward process-oriented design and governance. Second, it methodologically integrates Porter's Value Chain with BPMN, thereby linking strategic value creation with detailed operational process analysis in a reproducible and transferable manner. Third, it provides actionable insights for policymakers and practitioners by demonstrating how enhanced process integration, standardized information flows, and embedded quality and traceability controls can strengthen transparency, regulatory implementation, and operational resilience in capture fisheries supply chains.

2. METHODS

This study adopts a qualitative case study research design to analyse and redesign business processes within a high-value capture fisheries value chain. This approach is appropriate given that the objective of the study is not statistical generalization, but rather to achieve an in-depth understanding of process dynamics, actor interactions, and

operational vulnerabilities within a real-world context. To ensure methodological transparency, the research is structured into a stepwise research framework consisting of problem identification, data collection, process modelling, process analysis, process redesign, and model validation. This framework is illustrated in Figure 1 and explained in detail in the following subsections.

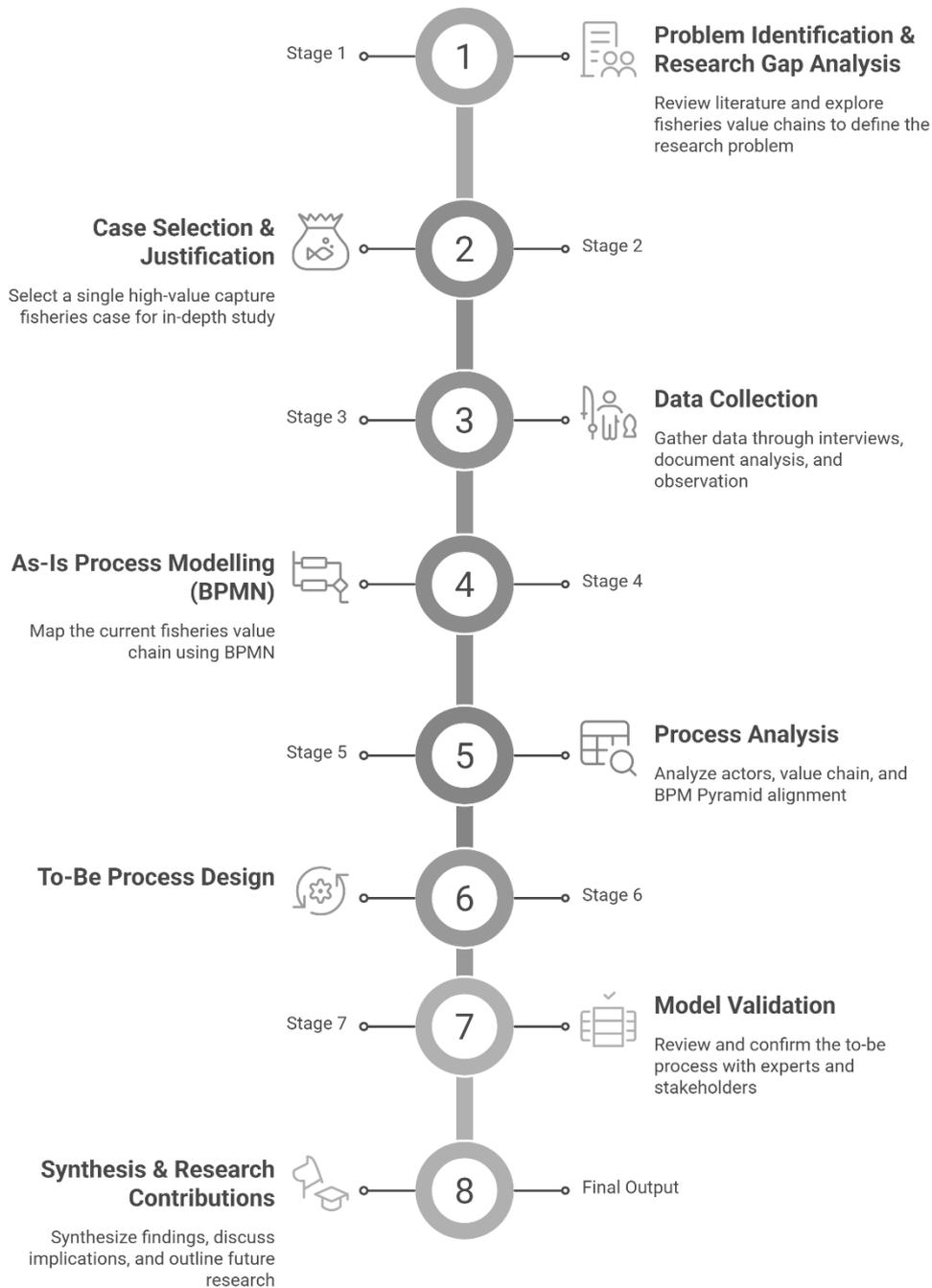


Figure 1. Research Framework

2.1. Problem Identification and Research Gap Analysis

The first stage focuses on identifying operational challenges and research gaps through a systematic literature review and contextual exploration of capture fisheries supply chains. The literature indicates that while value chain frameworks are widely used, they often emphasize structural and technological aspects, with limited attention to process-level integration and execution. This stage establishes the analytical focus on Business Process Management (BPM) as a means of bridging strategic value creation and operational practice.

2.2. Case Selection and Justification

The study employs a single high-value fisheries enterprise as the case study. Case selection was conducted purposively, based on the complexity of operations, involvement of multiple actors, and high exposure to operational risks related to perishability and traceability. Although the study focuses on a single case, the findings are intended to provide analytical generalization rather than statistical generalization. The proposed process-oriented framework can be transferred to other fisheries value chains with comparable characteristics.

2.3. Data Collection

Primary data were collected through semi-structured interviews with middle-level managers responsible for operational activities and for ensuring data completeness related to traceability within the company, complemented by a one-week field observation. The interviews and field observations aimed to identify and elucidate challenges associated with mandatory data compliance and traceability processes that influence the overall value chain and the end-to-end traceability of capture fisheries products. Secondary data were obtained from operational documents, internal reports, operational problem and direct process observations to support data triangulation and enhance the credibility of the findings. This study adheres to ethical principles in qualitative research. All participants provided informed consent prior to participation. The identities of individuals and the organization were anonymized to ensure confidentiality, and all collected data were used solely for academic research purposes.

2.4. As-Is Process Modelling Using BPMN

Based on empirical data, existing (As-Is) business processes were modelled using Business Process Model and Notation (BPMN). BPMN was selected due to its standardized syntax, ability to represent cross-organizational workflows, and suitability for communicating process logic to both technical and non-technical stakeholders. Process models were developed for key operational stages across the fisheries value chain, enabling a consistent representation of activities, information flows, and decision points.

2.5. Process Analysis

The As-Is process models were analysed using multiple analytical lenses, including:

1. Actor analysis, to identify roles, responsibilities, and interaction patterns;
2. Value chain analysis, to detect process gaps affecting performance and resilience;
3. BPM Pyramid analysis, to assess alignment between strategic objectives, business processes, and operational execution.

This analysis aimed to identify inefficiencies, redundancies, and sources of process vulnerability.

2.6. To-Be Process Design

Based on the analysis results, a To-Be process model was developed to enhance value chain resilience. The redesign focuses on improving process integration, clarifying decision logic, and strengthening control points across organizational boundaries. The To-Be model is presented as a conceptual process architecture that can be adapted according to organizational readiness and contextual constraints.

2.7. Model Validation

Model validation was conducted through expert review, stakeholder confirmation and BPM software validation. This process ensured that both As-Is and To-Be models accurately reflected operational realities and were feasible from a practical perspective. Feedback obtained during validation was used to refine the final process models.

2.8. Synthesis and Research Output

The final stage synthesizes analytical findings to derive theoretical and practical implications regarding the application of BPM and process-centric redesign in enhancing the resilience of capture fisheries value chains

3. RESULTS AND DISCUSSION

3.1. Actor Identification and Fisheries Value Chain Structure

The fisheries supply chain examined in this study consists of four key actors: fishing vessels, landing sites and auctions, processing industries, and distributors/retailers, as identified through interviews. Fishing vessels play a critical role in initial capture activities and operate under heterogeneous environmental and operational conditions that directly affect efficiency and productivity. Empirical studies indicate that the operational performance of fish landing ports significantly influences overall supply chain effectiveness, particularly in relation to human resource management and logistics efficiency [18].

Landing sites and fish auctions function as essential intermediaries, facilitating price discovery and supporting equitable transactions among stakeholders [19]. Auctions play a stabilizing role in fisheries markets, especially for fishers who depend on transparent and fair pricing mechanisms [19]. Processing industries contribute substantially to value enhancement by improving product quality and extending shelf life. Prior studies demonstrate that effective processing strategies can significantly reduce postharvest losses and increase economic returns [20], [21]. Distributors and retailers serve as the final link between producers and consumers, shaping market accessibility and consumer trust. The interdependence among these actors highlights the structural complexity of achieving a sustainable and profitable fisheries system [22], [23].

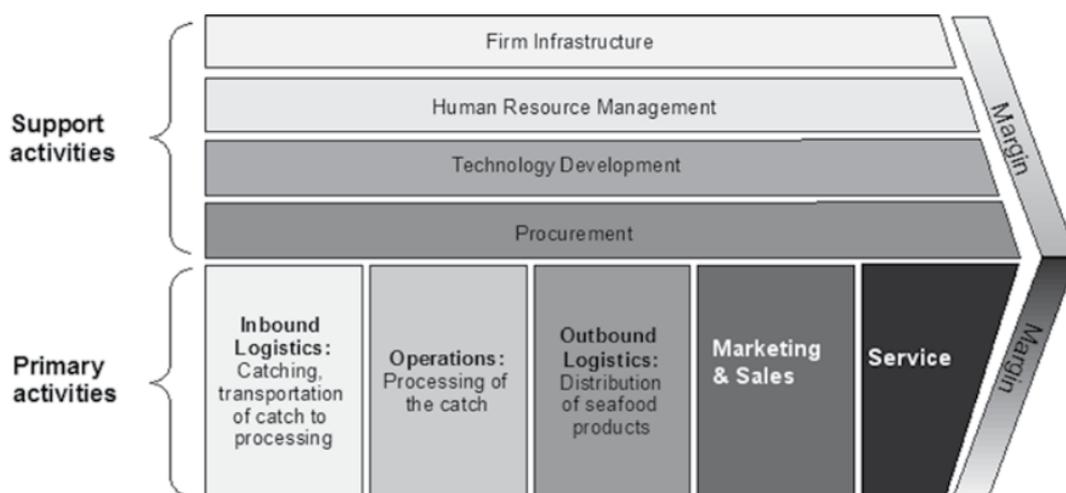


Figure 2. Fisheries Value Chain – Porter [24]

Based on this actor analysis, Porter's Value Chain was applied to structure value-creating activities. Figure 2 illustrates how value is generated through interrelated primary and support activities. Primary activities begin with inbound logistics, encompassing fishing operations and transport to landing points, where initial freshness and handling quality are critical to preventing quality degradation [24]. Processing operations—including sorting, cleaning, and chilling—directly influence product quality and longevity [25]. Outbound logistics ensure timely delivery through appropriate packaging and cold storage [26]. Marketing and sales activities connect products to consumers and expand market reach [27], while service activities such as traceability verification and quality assurance support operational integrity and recall readiness [14]. Support activities, including technology development and human resource management, underpin all primary activities and reinforce the importance of integrated quality and traceability management across the value chain [27]. To explicitly link actors with operational weaknesses, Table 1 summarizes the main responsibilities of each actor and the key process gaps identified in the current system.

Table 1. Actors and Key Process Gaps in the Fisheries Value Chain

Actor	Main Responsibilities	Identified Process Gaps
Fishing Vessels	Catching, initial handling, onboard recording	Manual data recording; subjective quality assessment; lack of standardized capture identifiers
Landing Sites / Auctions	Aggregation, grading, pricing	Inconsistent grading criteria; batch mixing; incomplete data transfer
Processing Industries	Processing, quality control, packaging	Retrospective traceability; fragmented quality documentation
Distributors / Retailers	Distribution and market delivery	Limited visibility into upstream quality and provenance

3.2. BPM Pyramid and Process Architecture Analysis

To translate the strategic value chain perspective into operational processes, the analysis was structured using the BPM Pyramid framework proposed by Dumas et al. (Figure 3). This framework reveals misalignment across strategic, tactical, and operational levels.

Level 1 – Process Landscape (Strategic Level):

- a) Fragmented end-to-end process visibility
- b) Traceability treated as a reporting requirement rather than an operational control
- c) Manual documentation practices limiting value generation related to freshness and quality [28].

Level 2 – Business Processes (Tactical Level):

- a) Catch recording, auction management, and processing executed in organizational silos
- b) Absence of standardized information exchange mechanisms
- c) BPMN modelling reveals hidden discontinuities at inter-organizational handoff points [29].

Level 3 – Sub-processes and Tasks (Operational Level):

- a) Heavy reliance on manual judgment in grading and acceptance decisions
- b) Lack of standardized decision gates and control criteria
- c) High susceptibility to errors and inconsistent outcomes [30]

This analysis demonstrates that inefficiencies arise primarily from weak alignment across BPM levels rather than isolated task-level failures, underscoring the need for process-oriented redesign [31].

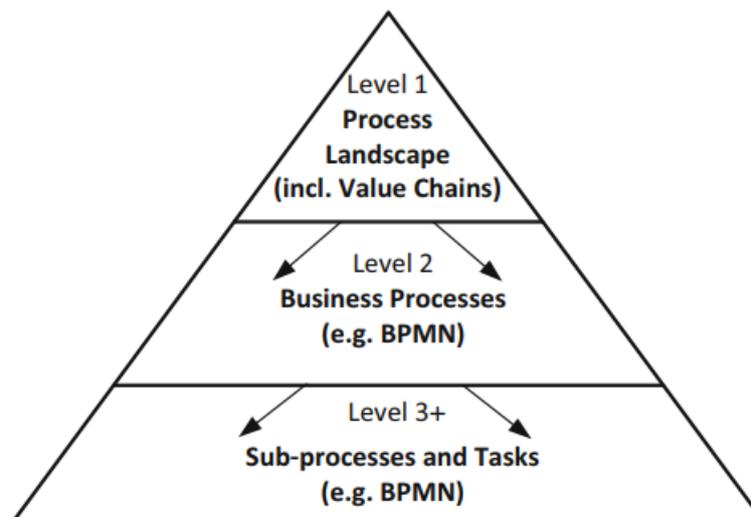


Figure 3. Three Level Process Architecture [32]

3.3. As-Is Process Analysis

The examination of existing process maps reveals significant inefficiencies that compromise accuracy and decision-making. Fishing vessels predominantly rely on handwritten records to document species, catch volume, and location, leading to inconsistent and fragmented data [33]. Similarly, the absence of standardized sorting and grading criteria generates classification inconsistencies that propagate downstream [29]. Figure 4 presents the Level 2 As-Is BPMN model, illustrating the core processes of Fish Catching, Fish Auction, Fish Processing, and Product Selling & Distribution. Although these processes are sequentially connected, information continuity across stages remains limited.

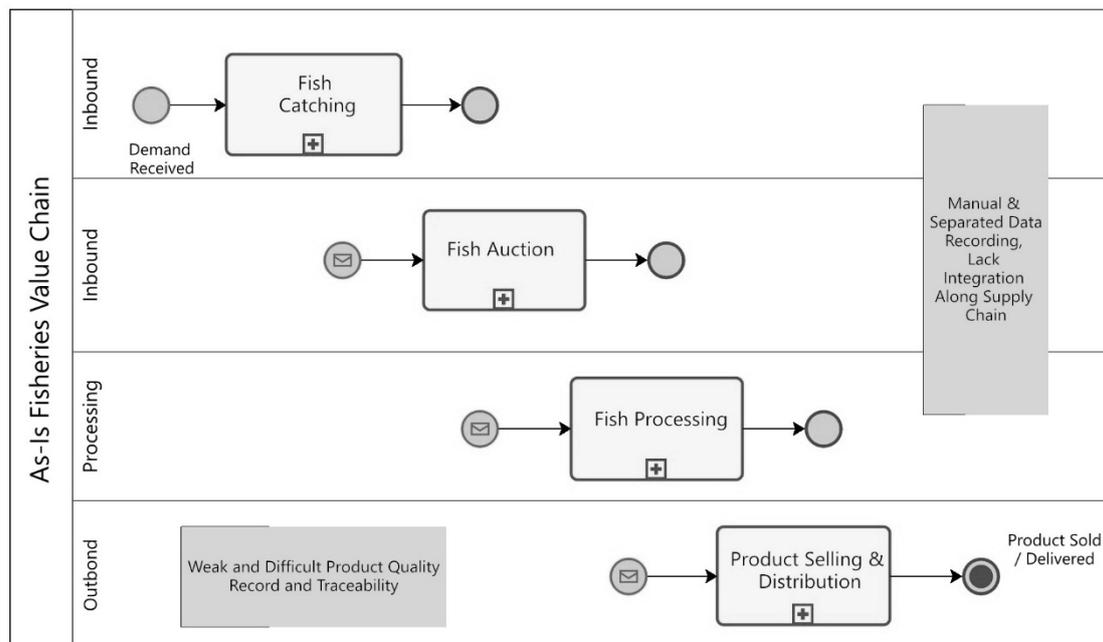


Figure 4. Second Level As-Is Condition of Fisheries Value Chain

At the subprocess level (Figure 5) below, the Fish Catching process operates autonomously at the vessel level. Catch data are generated locally but are not systematically transmitted downstream, resulting in fragmented traceability records [34].

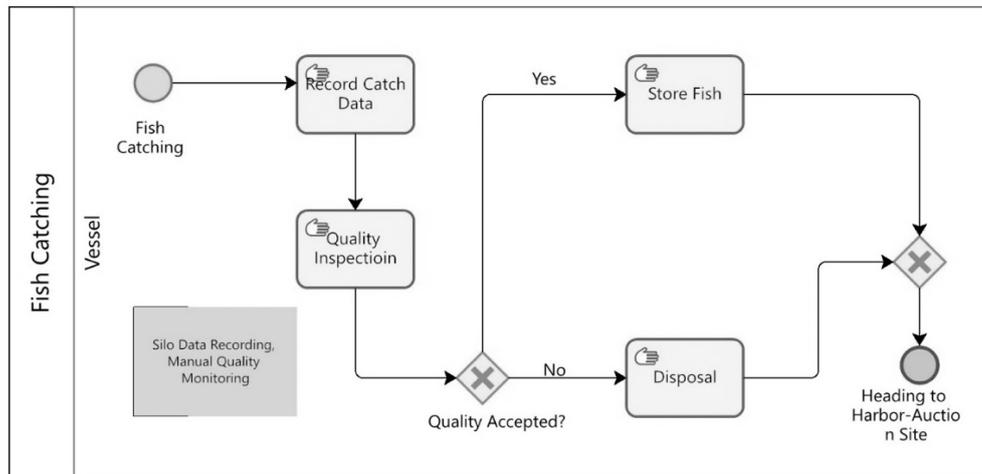


Figure 5. Third Level of As-Is Fish Catching Sub-Process

The lack of explicit data transfer protocols at handoff points further undermines traceability integrity [35][36]. Two principal systemic deficiencies are identified: (1) Manual and disjointed data recording with insufficient integration across actors. (2) Inadequate and inconsistent documentation of product quality and traceability. Accepted and rejected catches are often handled identically, preventing reliable quality differentiation and verification [37]. The absence of formal decision logic leads to information loss between vessel operations and auction processes, constraining informed decision-making [38], [39].

3.4. To-Be Process Design and Implementation Considerations

To address these deficiencies, a To-Be process model was developed to embed traceability and quality control directly into operational workflows (Figure 6). In contrast to the As-Is condition, traceability becomes an intrinsic component of process logic rather than a retrospective documentation activity. The To-Be model integrates vessel operations, auctions, processing, and distribution into a unified framework. Catch & Onboard Quality Monitoring initiates digital capture recording linked to a centralized traceability database [40]. Auction processes aggregate validated catches into traceable batches [16][40]. Processing stages apply structured quality checkpoints [41][12], while distribution authorization requires complete traceability verification prior to market release [45][46]. Implementation challenges include digital infrastructure availability, standardized training, and governance mechanisms for data ownership. Without

sufficient organizational readiness, operational benefits may be constrained despite conceptual robustness.

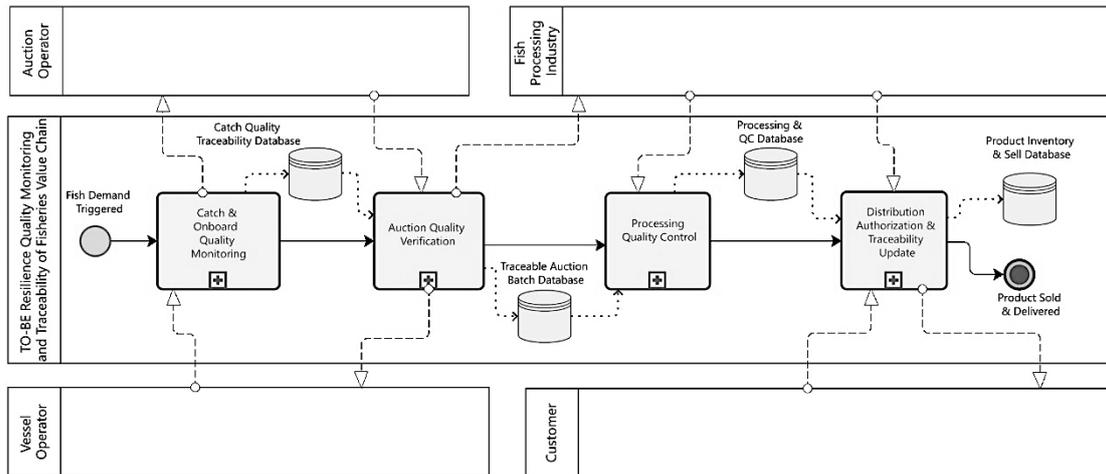


Figure 6. Second Level of Expected To-Be Value Chain Mechanism

3.5. Illustrative End-to-End Batch Flow in the To-Be Model

Following capture, species, volume, location, and time are digitally recorded and assigned a unique capture ID. Onboard quality inspection applies predefined criteria; accepted catches proceed, while rejected catches follow corrective handling. At auctions, validated captures are aggregated into traceable batches. Processing maintains data linkage at each transformation stage. Prior to distribution, only batches with complete records are authorized for release. Figure 7 demonstrates how the To-Be model preserves information continuity from catch to consumer.

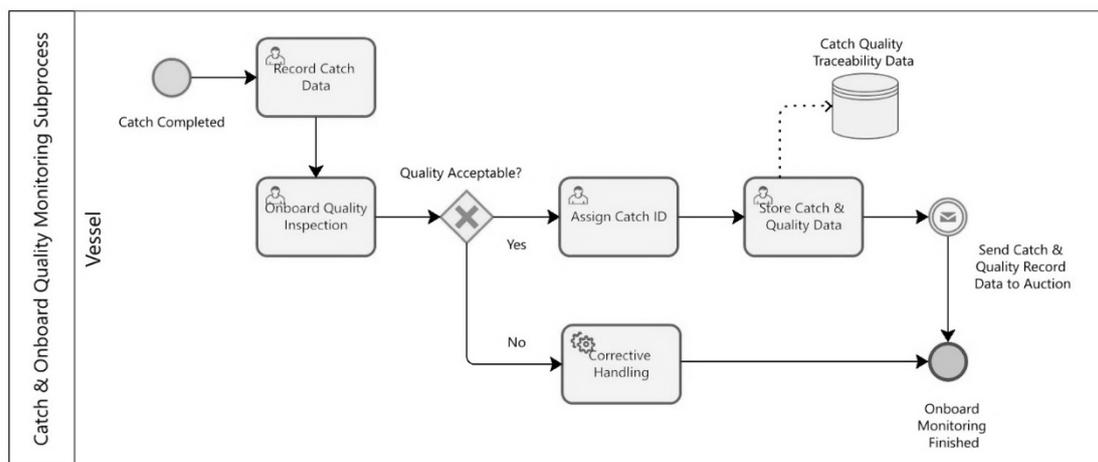


Figure 7. Third Level of Expected To-Be Catch and Onboarding Monitoring Sub-Process

3.6. Discussion

The findings indicate that the dominant sources of inefficiency in capture fisheries supply chains are not technological scarcity, but structural fragmentation and weak process integration across organizational boundaries. When Porter's Value Chain is combined with BPM Pyramid-guided BPMN modelling, it becomes clear that value erosion concentrates at handoff points—particularly between vessels and landing/auction sites, between auctions and processors, and between processors and distributors—where information is manually recorded, inconsistently interpreted, or not transferred in a standardized manner [29][31]. This helps explain why many actors appear operationally competent when viewed in isolation (e.g., vessels can catch and handle fish, auctions can grade and sell, processors can transform and package), yet the end-to-end chain still underperforms: the system lacks a shared process architecture that preserves data continuity and decision logic as products move downstream [22][23][35][36].

Across the BPM Pyramid levels, the study exposes a recurring misalignment between strategic intent and operational execution. Strategically, firms and regulators increasingly expect traceability to support transparency, quality assurance, recall readiness, and IUU risk mitigation [11][14]. Tactically, however, core processes such as catch recording, auction grading, and processing documentation remain organized in silos with limited interoperability, producing "islands of information" rather than a coherent chain of custody [29][33][34]. Operationally, process maps reveal heavy reliance on subjective judgement—especially in grading and acceptance decisions—and the absence of standardized decision gates, which increases variability and makes outcomes difficult to verify retrospectively [30][37]. In practical terms, this means traceability is often treated as a reporting obligation that occurs after the fact, rather than a real-time operational control that protects product integrity and preserves value in highly perishable supply chains [5][6][28][31].

The As-Is analysis further clarifies that traceability breakdown is tightly coupled with quality loss. Manual logbooks, inconsistent grading criteria, and batch mixing at auctions degrade both informational integrity and the ability to differentiate accepted versus rejected catches, undermining downstream quality assurance and market confidence [29][33][37]. Importantly, these are process design failures as much as they are data failures: when information transfer is not embedded into the workflow, the chain cannot

reliably answer basic governance questions—what was caught, where, when, by whom, how it was handled, and whether it met defined quality thresholds—without costly reconstruction efforts [34][38][39]. This supports the study's broader argument that traceability should be reframed as a value-generating capability that reinforces freshness management, dispute resolution, compliance assurance, and resilience—rather than as a compliance artefact appended at the end of operations [28][30][31].

The To-Be model demonstrates how these weaknesses can be reduced by redesigning process logic so that traceability and quality control are produced by default as products flow through the chain. Embedding standardized identifiers (e.g., capture IDs), structured quality checkpoints, and a centralized (or interoperable) traceability database transforms traceability from retrospective paperwork into an operational “nervous system” that supports governance, reduces ambiguity at handoffs, and increases end-to-end visibility [40][41][42][43]. The redesigned control logic—such as validated aggregation at auctions and distribution authorization conditioned on complete traceability records—directly addresses the discontinuities identified in the As-Is model and improves the feasibility of market-facing claims about provenance and handling quality [16][40][45][46]. In addition to supporting trust and transparency, this approach strengthens resilience by enabling quicker root-cause analysis during disruptions, more targeted recalls, and better coordination under supply variability driven by environmental and ecological conditions [4][5][6].

However, the study also highlights that process-centric redesign will only translate into real performance gains if implementation is matched with organizational readiness and multi-stakeholder coordination. In fisheries contexts—especially those involving smaller operators—digital infrastructure constraints, uneven digital literacy, and unclear governance over data ownership can limit adoption even when the conceptual design is robust [44][45]. This implies that implementation strategies should emphasize phased rollout, role-based training, and simple, low-burden data capture tools at the vessel and landing-site levels (where traceability integrity is first established) while aligning incentives so that upstream actors benefit from compliance through improved market access, pricing signals, or reduced disputes [7][10][11]. Without such enabling conditions, technology risks being layered onto existing fragmentation, reproducing the same traceability gaps in a digital form [8][9].

The primary study's contribution is leverage point for improving capture fisheries supply chain performance lies in process governance and interoperability—clarifying decision gates, standardizing data exchange, and designing handoffs that preserve both product and information integrity—rather than in standalone technology adoption [28][29][31]. The integrated Porter–BPMN approach provides a transferable way to connect strategic value creation to operational execution, making it possible to pinpoint where value is lost and how traceability can be operationalized as a capability that safeguards quality, compliance, and resilience across the chain [22][23][31][42][43].

4. CONCLUSION

This study demonstrates that improving traceability and resilience in capture fisheries supply chains requires process-oriented redesign rather than isolated technological interventions. By integrating value chain analysis with BPMN-based process modelling, the research identifies fragmented architectures and weak information continuity as primary sources of inefficiency. The proposed To-Be model embeds traceability and quality control directly into operational workflows, transforming traceability into an operational governance mechanism. While conceptually feasible, implementation depends on infrastructure readiness, institutional support, and capacity building. This study is limited by its focus on a single high-value enterprise and reliance on qualitative modelling rather than quantitative performance metrics. BPMN also does not capture behavioural incentives influencing compliance. Future research should validate the framework across diverse fisheries contexts, apply quantitative simulation, and integrate behavioural or incentive-based models. Further work on interoperability standards and regulatory alignment would strengthen policy relevance.

REFERENCES

- [1] S. Su, Y. Tang, B. Chang, W. Zhu, and Y. Chen, "Evolution of marine fisheries management in China from 1949 to 2019: How did China get here and where does China go next?" *Fish Fish (Oxf.)*, vol. 21, no. 2, pp. 435–452, Mar. 2020.
- [2] J. He and X. Zhang, "China revamping decades-old Fisheries Law to combat illegal, unreported, and unregulated fishing: Stimulating the intersection of law, technology, and markets," *Front. Ecol. Evol.*, vol. 10, Mar. 2022.

- [3] S. G. Lewis and M. Boyle, "The expanding role of traceability in seafood: Tools and key initiatives," *J. Food Sci.*, vol. 82, no. S1, pp. A13–A21, Aug. 2017.
- [4] J. Ji and Y. Li, "Does fishery digitalization matter in the sustainable development of fisheries? Evidence from China," *Sustain. Dev.*, vol. 32, no. 6, pp. 7382–7396, Dec. 2024.
- [5] N. U. Karim and U. M. Terengganu, "Innovative processing technologies for sustainable fisheries sectors," *J. Sustain. Sci. Manag.*, vol. 18, no. 9, pp. 1–5, Sep. 2023.
- [6] A. Grantham, M. R. Pandan, S. Roxas, and B. Hitchcock, "Overcoming catch data collection challenges and traceability implementation barriers in a sustainable, small-scale fishery," *Sustainability*, vol. 14, no. 3, p. 1179, Jan. 2022.
- [7] N. A. Dowling *et al.*, "Generic solutions for data-limited fishery assessments are not so simple," *Fish Fish (Oxf.)*, vol. 20, no. 1, pp. 174–188, Jan. 2019.
- [8] M. Cordova and K. M. Nava-Aguirre, "Achieving transparency through blockchain: sustainability of fishery supply chain management," *Internext*, vol. 17, no. 3, Sep. 2022.
- [9] G. Omitoyin and M. Moshood, "Evaluating digital transformation strategies in global supply chain management through strategic project leadership and measurable economic impact," *Magna Sci. Adv. Res. Rev.*, vol. 3, no. 2, pp. 122–138, Dec. 2021.
- [10] S. C. Batubara, M. S. Maarif, Marimin, and H. E. Irianto, "The Ideal Model of Supply Chain Management of Sustainability Industrial Capture fisheries in Maluku Province," *Mar. Fish. J. Mar. Fish. Technol. Manag.*, vol. 8, no. 2, pp. 137–148, Nov. 2017.
- [11] A. Kadfak and M. Widengård, "From fish to fishworker traceability in Thai fisheries reform," *Environ. Plan. Nat. Space*, vol. 6, no. 2, pp. 1322–1342, Jun. 2023.
- [12] M. Veena, K. Sravani, K. Dhanapal, G. P. Kumar, C. Manaswini, and D. C. Basha, "Blockchain technology for enhancing traceability and sustainability in fish and fishery products: Comprehensive review," *Int. J. Bio-resour. Stress Manag.*, vol. 19, no. Sep, 9, pp. 1–7, Sep. 2025.
- [13] R. A. I. Pratiwi, L. A. Fani, and F. Kusasi, "Blockchain technology in fisheries industry: A systematic literature review," *BIO Web Conf.*, vol. 134, p. 5004, 2024.
- [14] P. K. Patro, R. Jayaraman, K. Salah, and I. Yaqoob, "Blockchain-based traceability for the fishery supply chain," *IEEE Access*, vol. 10, pp. 81134–81154, 2022.
- [15] S. Ismail, H. Reza, K. Salameh, H. Kashani Zadeh, and F. Vasefi, "Toward an Intelligent Blockchain IoT-enabled fish supply chain: A review and conceptual framework," *Sensors (Basel)*, vol. 23, no. 11, p. 5136, May 2023.

- [16] T. D. Pratiwi, B. Wiryawan, and T. W. Nurani, "Implementation of tuna traceability in ocean fishing port of Nizam Zachman Jakarta," *Mar. Fish. J. Mar. Fish. Technol. Manag.*, vol. 12, no. 1, pp. 23–34, May 2021.
- [17] H. Metref, D. Calvo Dopico, and C. González Sotelo, "Análisis de oportunidades y transferencia de información en la implantación de la trazabilidad de productos pesqueros. Una aplicación empírica para el sector congelador y conservero gallego," *Harv. Deusto Bus. Res.*, vol. 5, no. 1, pp. 40–59, Jun. 2016.
- [18] A. Suherman, H. Boesono, F. Kurohman, and A. K. Muzakir, "Kinerja Pelabuhan Perikanan Nusantara (Ppn) Karangantu - Banten, Indonesia," *DEPIK*, vol. 9, no. 2, pp. 344–355, Jul. 2020.
- [19] H. O. Damayanti, S. W. Saputra, D. Wijayanto, A. K. Mudzakir, and A. F. Rudiyanto, "Management Strategy of 2nd and 3rd Class Fish Auction Location in Pati Regency, Indonesia," *Int. J. Anal. Hierarchy Process*, vol. 14, no. 2, Aug. 2022.
- [20] G. Tadifa, R. J. Banicod, D. Peralta, C. A. Ramos, and U. Montojo, "A study on postharvest losses in fisheries owing to changes in market supply and demand in the Philippines," *Philipp. J. Fish.*, pp. 97–114, Dec. 2022.
- [21] J. D. Karlsen, L. A. Krag, C. M. Albertsen, and R. P. Frandsen, "From fishing to fish processing: Separation of fish from crustaceans in the Norway lobster-directed multispecies trawl fishery improves seafood quality," *PLoS One*, vol. 10, no. 11, p. e0140864, Nov. 2015.
- [22] S. Espahbod *et al.*, "Blockchain-driven supply chain analytics and sustainable performance: Analysis using PLS-SEM and ANFIS," *Sustainability*, vol. 16, no. 15, p. 6469, Jul. 2024.
- [23] I. Wicaksana, R. Nurmalina, and S. Suprehatin, "Value chain upgrading: Evidence from smoked fish agribusiness in central java," *J. AGRISEP*, vol. 21, no. 1, pp. 243–256, Mar. 2022.
- [24] C. A. Intyas, A. Tjahjono, D. Koestiono, F. D. Riana, and S. Suhartini, "Value chain analysis of the marine ornamental reef: A case study in Banyuwangi, east java, Indonesia," *Environ. Res. Eng. Manage*, vol. 79, no. 2, pp. 21–31, Jul. 2023.
- [25] T. Salman, A. Aos, and A. Permana, "Value chain management of orchid businesses: A case study of the Indonesian Orchid Association of West Java," *AGRAR. J. Agribus. Rural Dev. Res.*, vol. 10, no. 1, pp. 90–104, Jun. 2024.

- [26] S.J. Kangarlouei and M.Y. Alghyani, "Investigating the effect of value chain on knowledge application for economic development," *Uncertain Supply Chain Manag.*, vol. 3, no. 2, pp. 123–128, 2015.
- [27] Nilesh D. Kulkarni and Saurav Bansal, "Transforming Supply and Value Chains: The Impact of Artificial Intelligence A Review," *International Research Journal of Modernization in Engineering Technology and Science*, Feb. 2024, doi: 10.56726/irjmets49042.
- [28] D. A. Willette and S. H. Cheng, "Delivering on seafood traceability under the new U.S. import monitoring program," *Ambio*, vol. 47, no. 1, pp. 25–30, Feb. 2018.
- [29] D. Bradley, M. Merrifield, K. M. Miller, S. Lomonico, J. R. Wilson, and M. G. Gleason, "Opportunities to improve fisheries management through innovative technology and advanced data systems," *Fish Fish (Oxf.)*, vol. 20, no. 3, pp. 564–583, May 2019.
- [30] R. Hilborn *et al.*, "Effective fisheries management instrumental in improving fish stock status," *Proc. Natl. Acad. Sci. U. S. A.*, vol. 117, no. 4, pp. 2218–2224, Jan. 2020.
- [31] J. Malik and H. Kristiana, "Sustainability Strategy for Small-Scale Fisheries Management: Case Study in Semarang City Coastal, Indonesia," *Journal of Tropical Fisheries Management*, vol. 5, no. 2, pp. 83–90, Dec. 2021.
- [32] Marlon Dumas, Marcello La Rosa, Jan Mendling, and Hajo A. Reijers, *Fundamentals of Business Process Management*, 2nd ed. New York: Springer, 2018.
- [33] M. Iqbal *et al.*, "Design and development of a Deep Learning-based automatic Fisheries Logbook filling tool," *Mar. Fish. J. Mar. Fish. Technol. Manag.*, vol. 15, no. 2, pp. 189–203, Nov. 2024.
- [34] A. Di Pinto *et al.*, "Species identification in fish fillet products using DNA barcoding," *Fish. Res.*, vol. 170, pp. 9–13, Oct. 2015.
- [35] H. Feng, X. Wang, Y. Duan, and X. Zhang Jian and Zhang, "Applying blockchain technology to improve agri-food traceability: A review of development methods, benefits and challenges," *J. Clean. Prod.*, vol. 260, no. 121031, p. 121031, Jul. 2020.
- [36] M. Danish and M. S. Hasan, "Robust Food Supply Chain Traceability System based on HACCP using Federated Blockchain," *KIET Journal of Computing and Information Sciences*, vol. 3, no. 2, p. 16, Jul. 2020.
- [37] K. Kandi, S. R. Katragadda, and R. Katakam, "Blockchain-enabled quality traceability framework for mechanical parts supply chains," *Journal of Computer Science and Technology Studies*, vol. 7, no. 10, pp. 521–527, Oct. 2025.

- [38] M. M. Mabkhot, R. S. Kalawsky, and A. Liaqat, "Introducing the Manufacturing Digital Passport (MDP): A new concept for realising Digital Thread data sharing in aerospace and complex manufacturing," *Systems*, vol. 13, no. 8, p. 700, Aug. 2025.
- [39] K. Patel, "AI+IoT+blockchain triad for smart traceability in the automotive industry," *International Journal of Research and Scientific Innovation*, vol. XII, no. VII, pp. 221–238, 2025.
- [40] E. Macusi, I. Nallos, E. Borazon, M. Castro, and C. Peralez, "Fisheries traceability, drivers, and barriers to its adoption: A review," *Philipp. J. Fish.*, pp. 266–284, Dec. 2024.
- [41] D. Miarka, B. Urbańska, and J. Kowalska, "Traceability as a tool aiding food safety assurance on the example of a food-packing plant," *Accreditation Qual. Assur.*, vol. 24, no. 3, pp. 237–244, Jun. 2019.
- [42] I. González-Puetate, C. L. Marín Tello, and H. Reyes Pineda, "Agri-food safety optimized by blockchain technology: review," *Rev. Fac. Nac. Agron. Medellín*, vol. 75, no. 1, Jan. 2022.
- [43] U.-O. U. Mary, N. C. Obiuto, and O. O. ThankGod, "Conceptual model improving secure data handling within confectionery enterprise systems," *Int J Sci Res Sci & Technol*, vol. 11, no. 4, pp. 740–754, Jul. 2024.
- [44] R. Guido *et al*, "A framework for food traceability: case study – Italian extra-virgin olive oil supply chain," *Int. J. Ind. Eng. Manag.*, vol. 11, no. 1, pp. 50–60, Mar. 2020.
- [45] A. V. Bajoria, "Blockchain-enabled audit trails: Revolutionizing RDBMS data integrity and security," *European Modern Studies Journal*, vol. 9, no. 4, pp. 1393–1403, Sep. 2025.