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Article Title

Disintermediation of Fresh Fish Distribution: Analysis of Online Market Efficiency and Logistics Barriers in Makassar City

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ABSTRACT

The acceleration of digital economic transformation in the national fishery sector offers potential for allocative efficiency by shortening conventional supply chains, yet its implementation often clashes with the reality of stagnant physical infrastructure. This study aims to analyze disintermediation mechanisms arising from online market adoption, evaluate the efficiency of cold chain logistics, and formulate strengthening strategies for the integrative distribution system in Makassar City. Using a qualitative descriptive research design, data were collected via triangulation through field observations at physical distribution nodes in Paotere Fish Auction Market, transaction activity observations on marketplace platforms, and documentation studies, which were then analyzed using the interactive model by Miles et al. The results reveal a sharp logistics paradox. On the one hand, the online market successfully enabled disintermediation, increased price transparency, and severed fishermen's dependence on traditional intermediaries. However, fundamental vulnerabilities were identified due to the absence of micro-scale cooling facilities and the use of non-standard last-mile delivery fleets. This condition results in accumulated risks of biological quality degradation and hidden operational cost inefficiencies. The study concludes that digital superstructure dominance without an adequate physical infrastructure foundation only yields pseudo-efficiency, threatening business sustainability. As a managerial implication, this study recommends implementing a hybrid logistics ecosystem through a Hub-and-Spoke model, transforming the Fish Auction Market into cold-chain-based fulfillment centers, supported by Public-Private Partnership policy synergy and the social engineering of fishermen's logistics literacy.

Keywords: *Cold Chain; Disintermediation; Fishery Logistics; Fresh Fish; Online Market.*

INTRODUCTION

The sustainability of the national capture fisheries sector relies heavily on Supply Chain Management efficiency, which guarantees product quality from upstream to downstream. Fishery products, particularly fresh fish, are categorized as highly perishable commodities that undergo rapid biological degradation immediately after capture (Bahebshi & Almaktoom, 2019). The primary challenge in distributing this commodity is maintaining temperature stability and minimizing logistical travel time to prevent significant post-harvest losses (Ramadhani et al., 2025; Tiaraningtyas et al., 2025). In the modern logistics paradigm, the integration between physical infrastructure and information systems is an absolute prerequisite for creating economic added value. Without integrated supply chain management, traditional fishermen are often in a weak bargaining position because they depend on conventional intermediaries that control distribution access (Arif et al., 2025). Therefore, modernizing the distribution system through technological approaches is an urgent priority to improve the competitiveness of fishery products in both domestic and regional markets.

The digital economic transformation offers potential solutions through disintermediation mechanisms, namely the reduction or elimination of intermediaries in the supply chain via online marketplaces. The adoption of digital marketing technology allows fishery business actors, including Micro, Small, and Medium Enterprises (MSMEs), to interact directly with end consumers, thereby shortening

the distribution chain and increasing price transparency (Nurhayati, 2023; Ulum et al., 2023; Wardani et al., 2023). Utilizing e-commerce platforms and social media has proven effective in expanding market reach and significantly increasing MSME sales volume through effective and efficient promotion (Desiani et al., 2021; Setiawati et al., 2022; Puryati & Kuntadi, 2024). This phenomenon indicates that digitalization is not merely a lifestyle trend but a strategic instrument for restructuring a fairer market for small-scale producers (Fakhriyyah et al., 2021; Refdi et al., 2023).

However, the effectiveness of online markets in fresh fish distribution is often hindered by the gap between the acceleration of digital transactions and the stagnation of physical logistics infrastructure, particularly in cold chain facilities. The availability of cold storage and refrigerated transport is a fundamental element for maintaining fish freshness during distribution from ports to consumers (Hakim & Erliza, 2019; Xyugan & Lysochenko, 2023). Empirical studies demonstrate that uncontrolled temperature fluctuations during transport are the main cause of fish quality degradation. This ultimately reduces the value of online sales and consumer confidence in online transactions (Afiyah et al., 2019; Ansar et al., 2024). The use of smart diagnostic technology and precise temperature management is required to ensure the food safety of fishery products distributed through digital channels (Castrica et al., 2019). Thus, the success of fishery digitalization is determined not only by the sophistication of the application but also by the reliability of the supporting physical infrastructure.

Makassar City, as the main fishery distribution center in Eastern Indonesia, represents the complexity of these challenges. On the one hand, digital technology development has driven changes in marketing and distribution strategies among local MSMEs, with adaptation to digital platforms beginning to grow (Majdi & Rizkiwati, 2021; Astuti et al., 2023). On the other hand, the socio-economic structure of fishermen and fish traders in Makassar is still heavily influenced by traditional patterns and dependence on physical market mechanisms at auction sites (Sayful, 2020). This dynamic creates a unique landscape in which digital modernization clashes with the limitations of the fishing community's social capital and basic infrastructure (Hardilawati, 2020; Nihayah et al., 2022). The survival strategy of fishermen amidst economic uncertainty often prioritizes daily cash liquidity over long-term technological investment (Sayful, 2020).

Sociological aspects and human resource capacity of fishermen also play a crucial role in the successful adoption of new distribution systems. Empowering fishing communities through equipment or technology assistance programs is often ineffective unless accompanied by institutional strengthening and an understanding of the prevailing moral economy structure in the community (Hidayat et al., 2025; Sayful & Muzakkir, 2025). The social construction of fishermen, including gender roles and patron-client relations, influences their acceptance level of digital innovations

(Firdausi et al., 2021). Furthermore, although various digital marketing training programs have been conducted to improve technological literacy (Emiliani et al., 2021; Widhiastuti et al., 2024), implementation gaps in the field persist due to the lack of a comprehensive supporting ecosystem.

Although extensive literature has discussed the benefits of digital marketing for MSMEs (Diatin et al., 2019; Irnad et al., 2023) and the technical importance of the cold chain (Arif et al., 2025), there is a scarcity of studies specifically analyzing the intersection between online market disintermediation mechanisms and physical logistics barriers in coastal urban contexts like Makassar. Most previous research tends to separate these two variables or focus only partially on one aspect. This research fills this gap by offering an integrative analysis that highlights the paradox between digital transaction efficiency and physical distribution inefficiency, and by evaluating cold chain infrastructure readiness as a determinant of online market success for fresh fish.

Based on the description above, this research formulates three objectives. *First*, to analyze the disintermediation mechanism formed through online market adoption and its impact on shortening the fresh fish supply chain in Makassar City. *Second*, to evaluate logistics cost efficiency and identify physical infrastructure barriers (cold chain) hindering digital distribution optimization. *Third*, to formulate a distribution system strengthening strategy that integrates digital technology with cold chain logistics management to improve the competitiveness of local fishery business actors. The results of this research are expected to make theoretical contributions to the adaptation of perishable product supply chains in the digital era and to offer practical recommendations for policymakers in designing a sustainable fishery logistics ecosystem.

METHOD

This study employs a qualitative descriptive research design to explore in-depth the disintermediation phenomenon in the fishery supply chain and the accompanying physical logistics barriers (Creswell, 2013). This approach was chosen for its relevance in dissecting the complexity of the socio-economic reality during the digital transition. Data in this context consists not only of numbers but also of distribution behavior patterns and infrastructure conditions requiring contextual interpretation. The research location was centered in Makassar City, South Sulawesi, which serves as the main fishery distribution node in Eastern Indonesia. This location selection was based on empirical urgency: Makassar possesses a strong traditional fishery market ecosystem, such as the Paotere Fish Auction Market, while simultaneously experiencing high digital technology adoption among micro-business actors. This spatial focus enables a sharp analysis of the clash between modernizing online trading systems and cold chain facility readiness in the field.

Data sources in this study are classified into primary and secondary data obtained without experimental intervention (Neuman, 2014). Primary data were collected through direct observation of physical logistics infrastructure conditions and distribution flows at Makassar's main fishery nodes, as well as digital observation of fresh fish transaction activities on marketplace platforms (ShopeeFood, GrabMart) and social media. These observations focused on recording the availability of cold storage facilities, packaging methods, and delivery time estimates offered by service providers. Meanwhile, secondary data were collected from the fishery agency annual reports regarding production volume, scientific literature on supply chain management, and local government policy documents relevant to MSME digitalization. Combining these two data types aimed to build a comprehensive understanding of the gap between digital potential and physical reality.

Data collection techniques were carried out through three systematic stages: passive participant observation, manual web crawling, and documentation study. Field observation was conducted to map the physical flow of fish from fishermen to delivery couriers, with a special focus on critical points where quality degradation may occur due to the absence of cooling facilities. Simultaneously, manual web crawling was performed to identify price patterns, freshness claims, and consumer satisfaction ratings on online fish stalls in the Makassar area. This stage adopted the method used by Wardani et al. (2023) to analyze trends in social media posts about fishery products. A documentation study was then conducted to verify field findings against operational logistics standard procedures and applicable regulations. Source triangulation techniques were used to test data validity by comparing physical observation results with claims listed on digital platforms.

Data analysis was performed using the interactive model by Miles et al. (2014), consisting of data condensation, data display, and conclusion drawing. In the condensation stage, the researcher sorted data relevant to disintermediation variables and logistics efficiency, discarded insignificant information, and grouped findings based on infrastructure barrier and market opportunity categories. The condensed data were then fully presented in a descriptive-analytical-critical narrative form outlining the complexity of inter-variable relationships without visual simplification. The final stage was conclusion drawing and verification, during which the researcher interpreted the data presented to answer the research objectives, namely evaluating logistics cost efficiency and formulating system integration strategies. This analysis was conducted in a circular, iterative manner until data saturation was achieved, yielding a comprehensive explanation of the fresh fish distribution paradox in the digital economic era.

RESULTS AND DISCUSSION

A. Disintermediation Mechanisms and Digital Trading Pattern Transformation

The transformation of fishery distribution patterns in Makassar City demonstrates a fundamental shift from a hierarchical traditional market structure toward a more decentralized digital ecosystem. Historically, as outlined in maritime anthropology studies in this region, fish trading mechanisms at major nodes such as the Paotere and Rajawali Fish Auction Markets relied heavily on the presence of *Punggawa,* or patrons, who controlled access to and distribution of capital (Sayful, 2020). In this conventional structure, catching fishermen (*Sawi*) held a weak bargaining position due to debt bondage and their capital dependence on the *punggawa*, creating a long, closed supply chain (Sayful & Muzakkir, 2025). However, digital observation results indicate that the adoption of online marketplaces (e.g., ShopeeFood and GrabMart) and social media (Facebook Marketplace/Instagram) has triggered a disintermediation phenomenon, namely the reduction of traditional intermediary roles. Through digital channels, independent fishermen and fish processing MSMEs can now bypass conventional distribution channels to interact directly with end users, dismantling the information asymmetry barriers that have long underpinned middlemen collectors' power.

This disintermediation mechanism operates through price transparency and market accessibility offered by technology. In the traditional auction system, pricing is often conducted through whispering mechanisms or closed agreements that disadvantage small-scale producers. Conversely, digital platforms force the formation of an open price standard, where consumers can compare prices of scads, milkfish, or skipjack tuna in real time across sellers. Astuti et al. (2023), in their study in Makassar, asserted that advances in digital technology have shifted local MSME marketing strategies toward a more data-oriented, consumer-preference-driven approach. This aligns with the findings of Wardani et al. (2023), who used web-crawling methods to demonstrate that fishery product demand trends can now be predicted from social media conversations. This allows sellers to adjust stock to market demand precisely without accumulating goods in collector warehouses. Thus, the online market functions not only as a showcase but also as a market intelligence tool, empowering fishermen to set selling prices that are more competitive yet profitable.

Adaptation to this technology varies depending on the platform type used and the business actor demographic characteristics. Younger business actors or those with better digital literacy tend to utilize advanced features on super-apps (such as promo features, flash sales, and cashless payments) to reach the urban middle-class market segment that prioritizes convenience (Desiani et al., 2021). On the other hand, the traditional fishing segment, which is newly transitioning to the digital realm, uses community-based social media platforms like Facebook

Marketplace and WhatsApp Groups more frequently. This choice is sociologically rational because these platforms enable more personal interaction and direct negotiation, replicating the nuance of physical market transactions but with a broader reach (Setiawati et al., 2022). This hybrid strategy demonstrates that digital transformation in the fishery sector is not singular but adaptive, adjusting to the social and cultural capital of the fishing community (Firdausi et al., 2021).

Sales volume increase and market reach expansion serve as primary indicators of this disintermediation success. Prior to digital adoption, the market reach of fish traders at Paotere Fish Auction Market was limited to physical buyers visiting the location or mobile retailers. With the integration of on-demand delivery services affiliated with marketplaces, the sales radius has expanded to all corners of Makassar City and its surroundings (Gowa and Maros). Studies conducted by Majdi and Rizkiwati (2021) and Ulum et al. (2023) confirmed that e-commerce utilization correlates positively with increased sales turnover, primarily due to the platform's ability to reach previously untapped niche markets, such as household consumers reluctant to visit wet markets. Additionally, review and rating features in applications create a social quality-control mechanism, forcing sellers to maintain product quality. This becomes an incentive often absent in traditional market transactions, which are typically one-off sales.

Digital disintermediation also serves as a crucial survival strategy for the economic sustainability of fishermen and MSMEs, especially in the wake of the pandemic. When social restrictions were enforced and physical markets experienced a decline in visitors, digital channels became the only distribution path that remained open and grew exponentially. Hardilawati (2020) identified that shifting to the digital ecosystem was the most effective tactical step for MSMEs to survive amidst the crisis. This phenomenon is reinforced by findings from Fakhriyyah et al. (2021), which show that product innovation and digital marketing are key to coastal community economic resilience. In the Makassar context, this adaptability not only saved short-term income but also formed a new, more efficient, and measurable trading *habitus*, reducing fatalistic dependence on price fluctuations at the auction level (Hidayat et al., 2025).

However, the transition to this digital business model demands improvements in managerial competence and technological literacy, which often become barriers for the older generation of fishermen. Although smartphone access is high, managing online stores, conducting digital bookkeeping, and designing visual marketing content remain challenging (Puryati & Kuntadi, 2024). This is where the role of education and mentoring becomes vital. Intensive digital marketing counseling programs have proven capable of improving business actor welfare by equipping them with technical skills to manage market algorithms (Refdi et al., 2023; Widhiastuti et al., 2024). Without adequate literacy, disintermediation will merely

shift fishermen's dependence from physical middlemen to "digital middlemen" (platforms), leaving them unable to compete with large traders with larger advertising budgets. Therefore, digital entrepreneurship-based empowerment becomes a prerequisite for inclusive enjoyment of disintermediation benefits (Nihayah et al., 2022).

Besides transaction efficiency, disintermediation also affects profit-margin restructuring within the supply chain. By cutting collector and wholesaler nodes, margins previously distributed to intermediaries can now be allocated to increase fishermen's income and lower consumer purchase prices (Irnad et al., 2023). Value chain analysis indicates that fishermen who sell directly via apps can achieve selling prices 15-20% higher than those for selling to collectors at Fish Auction Market. This aligns with the digital marketing effectiveness principles outlined by Nurhayati (2023), which state that shortening distribution channels automatically increases resource allocative efficiency. This phenomenon provides a positive signal for fisherman regeneration, as the fishery sector is increasingly viewed as a promising and modern business, no longer a subsistence profession synonymous with poverty (Diatin et al., 2019).

Although disintermediation mechanisms offer significant transaction efficiency, their sustainability relies heavily on another variable often overlooked in digitalization euphoria: physical logistics. The ease of clicking the "buy" button in an app does not necessarily guarantee that products reach consumers in fresh condition if unsupported by proper post-harvest handling. Digital data transaction speeds measured in milliseconds often collide with the slow physical movement of goods due to congestion and the absence of cooling infrastructure. Therefore, the analysis of the online market role cannot be separated from a critical evaluation of the cold chain infrastructure's capability to uphold the sweet promise of efficiency offered by algorithms (Ramadhani et al., 2025). The paradox between digital acceleration and physical stagnation is what will be discussed in depth in the next section.

B. The Logistics Paradox: A Critical Evaluation of Cold Chain Infrastructure

The previously discussed digital disintermediation euphoria often obscures the fragile logistics reality in the field, creating what is termed the "Logistics Paradox" in the Makassar fishery ecosystem. While order data flows through application servers in seconds, the physical flow of goods moves slowly, inefficiently, and is fraught with biological risks. Field observations at major distribution nodes reveal that the basic infrastructure required to maintain fish freshness—namely an integrated cold chain—is virtually non-existent at the micro-scale needed by online market participants. Arif et al. (2025) in their latest research asserted that without adequate cooling technology intervention, increases in sales volume through digital platforms will accelerate post-harvest loss accumulation. This

occurs because online market mechanisms demand "prime" quality standards, as reflected in attractive product photos. However, field realities still rely on conventional methods that use bulk ice blocks with often non-standard ratios, causing fish temperatures to spike sharply immediately after leaving storage warehouses.

Forensic tracing of the physical distribution path of fresh fish in Makassar reveals a frequently overlooked critical control point: initial handling in boat holds and landing docks. Although sales transactions have shifted to the digital realm, the unloading process at Paotere Fish Auction Market remains dominated by rough manual handling, leading to early physical and microbiological damage. Ansar et al. (2024) highlighted that fishermen's lack of understanding of cold chain principles results in fish being frequently exposed to tropical environmental temperatures (above 28°C) for hours before packaging for delivery. In the online sales context, delaying lowering the fish core temperature at this initial stage is fatal. This is because quality degradation will continue exponentially during the *last-mile* delivery process. Consequently, consumers often receive products that may visually appear intact but have undergone significant organoleptic decline, such as mushy flesh texture and detectable ammonia odors. Ultimately, this injures trust in the digital platform itself.

The problem intensifies at the *last-mile delivery* stage, where regular courier logistics infrastructure (motorcycle taxis) is not designed for perishable commodities at all. Observations of delivery fleets used by marketplace partners indicate that no active refrigeration is present on two-wheeled vehicles. Fresh fish is merely packed in layered plastic bags or simple Styrofoam boxes with limited ice gels. Tiaraningtyas et al. (2025), in a fish transportation risk analysis, warned that passive delivery methods like this are highly vulnerable to external temperature fluctuations, especially amid Makassar's dense traffic and high average air temperatures. This risk is exacerbated by mechanical shocks during travel, which can damage the fish's physical texture (Afiyah et al., 2019). Thus, the "fresh fish delivered to your doorstep" promise offered by applications is often compromised by the limitations of logistics fleets that have not transformed to meet commodity demands.

This infrastructure gap is rooted in a disparity in investment in cold storage. Although cooling facilities exist, in-depth analysis shows that the majority are export-oriented, tonnage-scale frozen warehouses. These facilities are inaccessible to small fishermen or online retail traders who require micro- or daily-scale storage. Hakim and Erliza (2019), in a financial feasibility analysis of cold storage, demonstrated that investment for cooling infrastructure is indeed very high, making MSMEs unable to own it independently. Consequently, a disconnection occurs: fish are caught in large quantities and sold quickly online due to fear of

spoilage, yet without adequate buffer stocks. Xyugan and Lysochenko (2023) termed this condition unsustainable supply chain management, in which the pressure to sell quickly overrides the imperative to maintain quality.

Furthermore, the myth regarding "cost efficiency" in online markets needs to be critically deconstructed. The general narrative holds that cutting intermediaries will lower costs; however, in reality, logistics costs per unit (unit economics) actually rise in the B2C (Business-to-Consumer) model. Ramadhani et al. (2025) emphasized that fragmented fishery supply chain management (unit delivery to many household addresses) is far more expensive than wholesale delivery to traditional markets. Packaging component costs (styrofoam, vacuum plastic, ice gels, duct tape) and app courier service fees often consume a significant portion of profit margins. This variable cost burden is often unrealized by fishermen initially because it is covered by the illusion of high gross turnover. In the long run, this inefficient logistics cost structure can erode the sustainability of the digital fishery business if no cheaper aggregator logistics solution exists.

Besides operational costs, financial risks from product returns pose a real threat in this immature logistics ecosystem. Bahebshi and Almaktoom (2019) explained that perishable products exhibit a deterioration effect, leading to a decline in their value over time. In online markets, when consumers complain that fish arrives in poor condition (due to courier delays or melted ice), digital platforms tend to favor consumers and issue automatic refunds. This loss is fully borne by the seller (fisherman/MSME), not the logistics service provider. This creates a new structural injustice: fishermen bear logistics risks beyond their control. Without cargo insurance or cold chain guarantees, trading fish online becomes a *high-stakes gamble* for small business actors.

A review of modern diagnostic technologies, as proposed by Castrica et al. (2019) using smart devices for freshness detection, illustrates how far behind the quality control system in Makassar is. In developed nations, integrating real-time temperature sensors (IoT) into packaging enables tracking of temperature history from producer to consumer. In Makassar, quality control is still based solely on trust and visual inspection. The lack of objective data on fish condition at delivery makes it difficult to resolve transaction disputes. Consumers can only assess goods when they arrive, and if disappointed, they will give low ratings that can kill the store's reputation. This underscores that digital literacy alone is insufficient; logistics literacy and the adoption of more advanced quality assurance technology are required to ensure the sustainability of the online fish market.

In conclusion, this critical evaluation reveals that cold chain infrastructure in Makassar City is not yet ready to support digital economic acceleration in the fishery sector. There is asynchronous development between the rapidly advancing digital superstructure (apps, internet, payments) and the stagnant physical

infrastructure (frozen warehouses, cold transport). This paradox not only hinders fisherman profit optimization but also threatens food safety and long-term consumer trust. If left unchecked, the online market will be merely a fleeting trend, failing to have a structural impact on fishermen's welfare. Therefore, intervention strategies extending beyond mere marketing training into logistics engineering and physical infrastructure investment are required and will be discussed as integrative solutions in the final section.

C. System Integration Strategies: Towards a Hybrid Logistics Ecosystem

Responding to the logistics paradox outlined previously, the conventional approach of focusing solely on improving digital marketing literacy proves inadequate to address the complexities of fresh fish distribution. Many previous studies have recommended social media training as a single solution for MSMEs (Emiliani et al., 2021; Refdi et al., 2023; Widhiastuti et al., 2024). However, a critical analysis of field findings shows that without intervention in the physical infrastructure layer, the order increases resulting from digital marketing actually backfire, magnifying losses from damaged goods. The distribution strengthening strategy must shift from a partial approach to a hybrid logistics ecosystem, where digital information system integration is tightly synchronized with physical cold chain management. This strategy requires that every increase in digital sales capacity must be preceded by, or at least accompanied by, an increase in cold storage and delivery capacity.

The recommended operational model for the Makassar context is a micro Hub-and-Spoke system that empowers Fish Auction Markets and Fish Landing Centers as fulfillment centers equipped with communal cold-chain facilities. In this model, the Fish Auction Market functions not only as a physical transaction market but also as a logistics hub, where caught fish are immediately sorted, cleaned, and pre-cooled before being distributed by app couriers. Xyugan and Lysochenko (2023), in a recent study on supply chain management, emphasized the importance of integrated logistics centers to reduce distribution costs. By centralizing courier pickup points at Fish Auction Markets with shared cooling facilities, expensive cold-storage investment costs can be borne collectively or subsidized by the government (Hakim & Erliza, 2019). Thus, individual fishermen are not burdened by high fixed asset investment costs while still enjoying industrial-quality standards.

This physical infrastructure strengthening must be accompanied by the adoption of smart quality assurance technology to build objective consumer trust. The use of digital freshness certification labels integrated into online market applications becomes a vital instrument. As noted by Castrica et al. (2019), applying simple diagnostic technology or temperature sensors to packaging can

provide consumers with transparency, ensuring that the fish they purchase has maintained its cold chain integrity. This temperature history data can be displayed on the application as a value proposition distinguishing professional fishermen from haphazard traders. This strategy not only protects consumers but also shields fishermen from baseless return claims, creating a fair, data-driven transaction environment.

Realizing this strategy requires a collaborative financing model through a Public-Private Partnership scheme. The Makassar City Local Government and the Fisheries Agency hold a central role as basic infrastructure providers (revitalizing Fish Auction Markets into Cold Chain Hubs), while private platforms (such as Grab/Gojek/Shopee) act as logistics aggregators providing specialized refrigerated fleets (such as standard thermo-bags) for their driver partners. Ramadhani et al. (2025) asserted that supply chain collaboration is the key to sustainability. Through this synergy, digital platforms can offer specific tariff incentives for fish deliveries that meet packaging standards, while the government provides energy subsidies for cold-warehouse operations. This synergy will lower the per-unit logistics costs, keeping the final price to consumers competitive despite higher handling standards.

However, this technical and managerial transformation will not succeed without social engineering to change fishermen's mindsets. Hidayat et al. (2025), in an evaluation of fisherman empowerment programs, found that tool assistance is often abandoned when it is incompatible with local culture. Therefore, this integration strategy must position fishermen not as passive objects but as active subjects with economic agency (Sayful & Muzakkir, 2025). The education provided must no longer be limited to creating Instagram accounts, but logistics literacy: understanding that temperature is money. Changing the *habitus* from a "catch-direct-sell" mentality to "catch-manage temperature-sell high" requires intensive sociological mentoring, leveraging existing local patronage structures while directing them toward more transparent, modern business practices (Sayful, 2020).

Furthermore, empowering the role of fisherwomen and fishermen's wives in post-harvest management becomes a crucial supporting strategy. Firdausi et al. (2021) highlighted women's central role in the development of coastal economies. In this hybrid ecosystem, fisherwomen groups can be empowered as fulfillment center operators at the Fish Auction Market, tasked with sorting, standard packaging, and application order management. Women's involvement ensures the quality control process is carried out more meticulously and consistently. This also provides income diversification for fishing households, reducing economic vulnerability during lean seasons and strengthening community resilience against market shocks.

As a strategic conclusion, the integration between online markets and the cold chain is not an option, but a necessity for Makassar's fishery future. This distribution strengthening strategy recommends a shift in policy focus from mere surface-level digitalization to deep logistics infrastructure. Successful implementation of this strategy will create a resilient distribution system in which digital efficiency and physical quality go hand in hand. Thus, the "Logistics Paradox" can be transformed into "Logistics Synergy," which ultimately leads to real, sustainable improvements in fisherman welfare, not just pseudo-numbers on application screens.

CONCLUSIONS AND SUGGESTIONS

This study concludes that online market adoption in the fresh fish distribution sector in Makassar City has created an effective disintermediation mechanism, cutting traditional intermediaries' roles and increasing price transparency. This digital transformation has enabled the reconstruction of the previously *oligopsonistic* market structure into a more competitive one, where fishermen and MSME actors have direct access to consumer preferences and market data. Utilizing digital platforms as market intelligence instruments enables fairer price formation and increases gross profit margins for small-scale producers. These findings confirm that transactionally, the digital economic ecosystem in Makassar's fishery sector is moving toward allocative efficiency, opening opportunities for broader economic inclusion for fishing communities previously marginalized in conventional supply chains.

However, this digital transaction efficiency clashes with the reality of physical logistics inefficiency, creating a development paradox in this sector. The evaluation of cold chain infrastructure demonstrates a fundamental gap between online ordering acceleration and post-harvest handling capacity. The absence of integrated micro-scale cooling facilities and the use of non-standard *last-mile* delivery methods result in high risks of product quality degradation and hidden operational costs swelling. This condition underscores that digitalization without adequate physical infrastructure support yields only *pseudo-efficiency*. Without intervention at the logistics layer, the online market may incur economic losses from biological spoilage of poorly handled perishable goods, thereby threatening the long-term sustainability of the technology adoption itself.

In response to these dynamics, distribution system strengthening strategies cannot rely solely on digital marketing training. The urgent solution is to implement a hybrid logistics ecosystem using a Hub-and-Spoke model, transforming Fish Auction Markets into cold-chain-based fulfillment centers. This integration necessitates cross-sector collaboration through Public-Private Partnership schemes to provide communal cooling infrastructure and specialized logistics fleets, as well as the application of smart quality assurance technology to build objective trust. Beyond technical aspects,

the success of this strategy relies heavily on social engineering to shift the fisherman paradigm from a mere production orientation to a quality management orientation, where logistics literacy is instilled as a new core competence equivalent to seafaring skills.

Implicatively, this research recommends that policymakers and platform developers shift their intervention focus from merely pursuing transaction volume to strengthening the quality of the distribution ecosystem. For local governments, budget priorities must be allocated to revitalizing cooling facilities at fish landing points, while for the private sector, feature innovation must begin to accommodate product temperature trail transparency. Synergy between supportive infrastructure policies, logistics technology innovation, and the empowerment of fisherman social capacity constitutes an absolute prerequisite for realizing a resilient, efficient, and sustainable fishery distribution system in the digital economic era.

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