

Supply Chain Performance and Capture Fish Demand Fulfillment in Bandung

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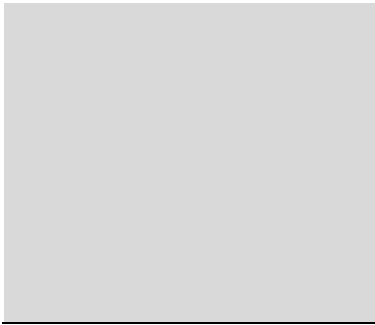
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Abstract

Urban capture-fish supply chains must preserve product quality and supply continuity while fulfilling customer orders. This study examines the relationships among product quality, supply availability, supply chain management effectiveness, supply chain performance, and market demand fulfillment in Bandung, Indonesia. A cross-sectional survey involved 350 business units selected from an accessible population of 900 through multistage sampling and proportional stratification across seven business groups. Questionnaire data were analyzed using covariance-based structural equation modeling with robust maximum likelihood estimation. Product quality and supply availability were positively associated with management effectiveness, with path coefficients of 0.444 and 0.448, jointly explaining 64.5% of its variance. Management effectiveness was positively associated with supply chain performance (0.824) and demand fulfillment (0.125). Supply chain performance was positively associated with demand fulfillment (0.768) and partially mediated its relationship with management effectiveness, with an indirect coefficient of 0.633. The findings identify operational performance as a prominent link between effective coordination and order fulfillment. Improving operational flexibility and controlling product damage should accompany efforts to strengthen quality and supply continuity. The cross-sectional design supports structural associations rather than temporal causal conclusions.

Abstrak

Pemenuhan pesanan ikan tangkap memerlukan pengelolaan mutu dan kontinuitas pasokan. Penelitian ini menguji hubungan kualitas produk, ketersediaan pasokan, efektivitas manajemen rantai pasok, kinerja rantai pasok, dan pemenuhan permintaan pasar di Kota Bandung. Survei potong lintang melibatkan 350 unit usaha dari populasi terjangkau 900 unit usaha melalui pengambilan sampel bertahap dan stratifikasi proporsional pada tujuh kelompok pelaku. Data kuesioner dianalisis menggunakan pemodelan persamaan struktural berbasis kovarians dengan estimasi kemungkinan maksimum yang robust. Kualitas produk dan ketersediaan pasokan berhubungan positif dengan efektivitas manajemen, dengan koefisien jalur 0,444 dan 0,448, serta bersama-sama menjelaskan 64,5% variasinya. Efektivitas manajemen berhubungan positif dengan kinerja rantai pasok sebesar 0,824 dan pemenuhan permintaan sebesar 0,125. Kinerja rantai pasok berhubungan positif dengan pemenuhan permintaan sebesar 0,768 dan memediasi secara parsial hubungan efektivitas



manajemen dengan pemenuhan permintaan, dengan koefisien tidak langsung 0,633. Temuan menempatkan kinerja operasional sebagai penghubung penting antara koordinasi dan pemenuhan pesanan. Perbaikan perlu memprioritaskan fleksibilitas operasi dan pengendalian kerusakan. Desain potong lintang membatasi kesimpulan sebab akibat.



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INTRODUCTION

Bandung is a consumption market for capture fish that depends on product flows from producing regions. As an inland city without a coastal area, meeting market needs requires procurement and distribution networks across regions. For businesses, the central challenge is to ensure that available fish meet customers' requirements for species, quantity, quality, and delivery time. Dependence on external supplies makes coordination among suppliers, storage facilities, transport providers, and sellers an important part of market service.

The perishability of fish increases the demands placed on these networks. Declining freshness during transportation can require additional handling, lead to product rejection, and reduce the quantity available for sale. Afiyah et al. (2019) examined the relationship between distribution chains and the quality of little tuna during delivery to consumer areas. In a different setting, Hidayah et al. (2022) identified a gap between fish availability and the raw material requirements of processing industries in Brondong. These studies indicate that the presence of products alone does not guarantee suitable quality or sufficient supply for downstream users.

A local study by Wardah et al. (2019) described the supply chain structure for fresh marine fish used by seafood restaurants in Bandung. That study provides context for the connections among participants in an urban market. However, structural mapping needs to be complemented by an examination of relationships among product conditions, supply, management processes, and order fulfillment across a broader range of businesses. The distinction between input conditions and service outcomes is substantive: products considered satisfactory may still be unavailable in the assortment and at the time required by customers.

Supply chain management emphasizes coordination across organizations to connect product flows, information, and decisions with customer needs (Mentzer et al., 2001). Research on integration associates the management of internal processes and partner relationships with operational performance (Flynn et al., 2010). Cao and Zhang (2011) also identify collaboration as a source of

collaborative advantage associated with firm performance. Zeng et al. (2013), meanwhile, distinguish internal quality management practices from quality interactions with suppliers and customers. Product conditions therefore need to be understood alongside the management practices that connect supply chain participants.

The dynamic capabilities perspective helps explain the need to adapt management when supply and demand change. Teece et al. (1997) emphasize the ability to integrate and reconfigure internal and external competencies. Teece (2007) further describes processes for sensing changes, seizing opportunities, and transforming resources. In fish supply chains, this perspective is relevant to the use of supply information when adjusting procurement, storage capacity, and distribution. It provides an interpretive foundation here; dynamic capabilities are not measured as a separate construct in this study.

This study distinguishes supply chain management effectiveness from supply chain performance and market demand fulfillment. Management effectiveness captures assessments of coordination, information integration, planning synchronization, and collaboration. Performance captures operational outcomes in cost efficiency, process speed, flexibility, and damage control. Demand fulfillment captures the completeness, timeliness, and reliability of order fulfillment. These distinctions make it possible to examine whether effective management is associated with market outcomes directly and through operational execution.

The study contributes an integrated examination of these five constructs in an urban capture-fish consumption market. Its objectives are to describe the condition of each construct, examine the relationships of product quality and supply availability with management effectiveness, and assess the roles of management effectiveness and performance in demand fulfillment. The model proposes positive relationships along five direct paths and five indirect paths. The indirect paths connect product quality and supply availability with performance and demand fulfillment through management effectiveness, and connect management effectiveness with demand fulfillment through performance. This design examines statistical mechanisms linking input conditions, management, operations, and service outcomes.

RESEARCH METHODS

The study employed a quantitative survey approach with descriptive and hypothesis-testing components. Cross-sectional data were collected in Bandung in 2026. The unit of analysis was a business involved in capture-fish procurement, handling, storage, processing, distribution, or

marketing. Business participants provided information about activities with which they were familiar within their businesses. Accordingly, the business was the unit of analysis, while respondents' answers provided the measurements.

The accessible population comprised 900 businesses: 40 fish collectors, 20 distributors, 100 wholesalers, 250 small traders or retailers, 120 processing businesses, 180 restaurants, and 190 seafood stalls. The sample consisted of 350 businesses. Selection used multistage sampling, stratification across the seven business groups, proportional allocation, and random selection at the final stage. Sample size planning accounted for the accessible population, a 95% confidence level, a proportion of 0.50, and a planning margin of error of 4.1%. This margin was used to determine sample requirements and should not be interpreted as the margin of error for all structural model coefficients.

The main instrument was a questionnaire comprising 51 statements measuring product quality (X1), supply availability (X2), supply chain management effectiveness (Y), supply chain performance (Z1), and market demand fulfillment (Z2). Responses used five levels of agreement, ranging from strongly disagree to strongly agree. Product quality covered assessments of fish quality, including freshness and physical integrity. Supply availability covered continuity, volume adequacy, stability, and certainty. Management effectiveness covered coordination among participants, information integration, planning synchronization, collaboration, and problem solving.

Supply chain performance was measured through cost efficiency, process speed, operational flexibility, and control of product damage and loss. Demand fulfillment was measured through completeness, timeliness, and reliability. Interviews, observations, and documentation were used to understand business activities and were not combined with questionnaire scores in model estimation. The scores represent respondents' assessments rather than laboratory measurements of fish quality, audited logistics costs, or calculations of aggregate demand among Bandung residents.

Descriptive analysis used frequencies, percentages, and mean scores. Hypothesis testing used covariance-based structural equation modeling with LISREL 8.70. Normality assessment indicated that multivariate normality was not satisfied; estimation therefore used robust maximum likelihood with the Satorra–Bentler correction. The measurement model was second order: questionnaire items measured dimensions at the first level, and dimensions measured latent constructs at the second level.

Measurement evaluation applied minimum thresholds of 0.50 for standardized factor loadings, 0.70 for construct reliability, and 0.50 for average variance extracted (Hair et al., 2019). Model fit was assessed jointly using residual measures and fit indices, while also reporting measures that did not satisfy the study's criteria. Relationships were tested using coefficient direction and t statistics

with an absolute threshold of 1.96 at the 5% significance level. Indirect effects were interpreted using the reported indirect-effect test statistics, rather than solely the significance of their component paths.

The structural model was specified as $Y = \gamma_{11}X_1 + \gamma_{12}X_2 + \zeta_1$; $Z_1 = \beta_{21}Y + \zeta_2$; and $Z_2 = \beta_{31}Y + \beta_{32}Z_1 + \zeta_3$. The covariance between X_1 and X_2 was estimated without assigning a causal direction. Coefficients of determination described the proportion of variance in endogenous constructs explained by the model within the sample. The model did not include direct paths from X_1 or X_2 to Z_1 or Z_2 . Serial mediation through both Y and Z_1 was not treated as a separately tested finding because statistics for those specific effects were unavailable.

RESULTS AND DISCUSSION

Descriptive results show that assessments of product quality, supply availability, and management effectiveness were higher than assessments of operational performance and demand fulfillment. Table 1 summarizes relatively favorable input and process conditions, while service outcomes remained in the fair category. The categories follow the classifications used in the study's results.

Table 1. Supply chain conditions assessed by 350 businesses

Variable	Mean	Category
Product quality	3.54	Good
Supply availability	3.56	Good
Supply chain management effectiveness	3.54	Effective
Supply chain performance	3.25	Fairly good
Market demand fulfillment	3.03	Fair

Source: Analysis of the study questionnaire.

Within product quality, physical integrity received relatively low ratings. Within supply availability, volume adequacy was rated more favorably than stability and certainty. This directs attention to supplier reliability and arrival schedules, because adequate volume does not necessarily mean products are available when required. Within management effectiveness, information integration received more favorable ratings than coordination among participants, particularly the alignment of procurement, storage, and distribution.

Within performance, operational flexibility and control of damage and loss each had a dimension mean of 3.02. Areas requiring attention included adjustments to storage and transport capacity, changes to routes or schedules, and control of product rejection. Within demand fulfillment,

completeness was the lowest-rated dimension, with a mean of 2.97. Relative difficulties concerned providing the required fish quantities, fulfilling complete orders, and replenishing shortages within the required time. Differences in construct means are descriptive and do not demonstrate a causal decline from one stage to another.

Measurement evaluation supported the hierarchical construct structure. At the first level, the lowest item loading was 0.640, the lowest dimension construct reliability was 0.757, and the lowest dimension average variance extracted was 0.510. At the second level, the lowest dimension loading was 0.711, the lowest construct reliability was 0.925, and the lowest construct average variance extracted was 0.756. All these minimum values satisfied the adopted criteria. This evidence supports convergent measurement and construct reliability but does not, by itself, establish discriminant validity between constructs.

Table 2. Structural model fit measures

Measure	Result	Study criterion	Assessment
Chi-square probability	$p < 0.001$	$p > 0.05$	Not met
χ^2/df	2.81	< 2	Not met
RMSEA	0.067	< 0.08	Met
SRMR	0.049	< 0.08	Met
GFI	0.906	> 0.90	Met
AGFI	0.870	> 0.80	Met
NFI	0.986	> 0.90	Met
NNFI	0.989	> 0.90	Met
RFI	0.983	> 0.90	Met
IFI	0.991	> 0.90	Met
CFI	0.991	> 0.90	Met

Note: RMSEA = root mean square error of approximation; SRMR = standardized root mean square residual; GFI = goodness-of-fit index; AGFI = adjusted GFI; NFI = normed fit index; NNFI = non-normed fit index; RFI = relative fit index; IFI = incremental fit index; CFI = comparative fit index.

Source: LISREL estimation results.

Table 2 indicates that exact fit was not supported by the chi-square test and that the chi-square-to-degrees-of-freedom ratio did not meet the study's threshold. However, residual measures and the other fit indices satisfied the adopted criteria. Overall model fit was interpreted as adequate, with these mixed results explicitly acknowledged. Estimation was reported to converge without negative

error variances or parameters outside acceptable bounds. This assessment does not establish that the model is free from specification error.

Table 3. Direct path coefficients in the supply chain model

Path	Coefficient	t	p
X1 → Y	0.444	10.288	< 0.001
X2 → Y	0.448	9.251	< 0.001
Y → Z1	0.824	19.904	< 0.001
Y → Z2	0.125	2.242	0.025
Z1 → Z2	0.768	12.372	< 0.001

Note: X1 = product quality; X2 = supply availability; Y = supply chain management effectiveness; Z1 = supply chain performance; Z2 = market demand fulfillment. Coefficients are the path coefficients reported in the model results. Source: LISREL estimation results.

All five direct relationships were positive and significant at the 5% level. Product quality and supply availability were associated with management effectiveness with coefficients of 0.444 and 0.448, respectively. Together, the two constructs explained 64.5% of the variance in management effectiveness. The coefficient difference was only 0.004 and does not justify describing supply availability as more dominant without testing the difference between coefficients. The coefficient of determination represents explanatory power and does not replace a separate joint significance test.

These results indicate that quality conditions and supply certainty are associated with businesses' ability to manage activities jointly. Better quality may facilitate handling and product allocation decisions, while more certain supply information may support procurement and distribution scheduling. This explanation is an operational interpretation of the estimated relationships. Afyiah et al.'s (2019) findings on quality during distribution reinforce the relevance of product control throughout the network. Zeng et al. (2013) also indicate that quality management practices should be considered through relationships among internal processes, suppliers, and customers. This study complements that perspective by treating product conditions as a construct associated with management effectiveness.

The relationship between management effectiveness and supply chain performance was the largest direct path, with a coefficient of 0.824. Management effectiveness explained 67.8% of the variance in performance. This relationship is consistent with the argument that integration and collaboration are associated with improved operational outcomes (Flynn et al., 2010; Cao & Zhang, 2011). Procurement coordination, information sharing, and synchronized planning provide a basis for

managing capacity and responding to disruptions. However, the coefficient's magnitude does not mean that all performance dimensions were rated favorably. Relatively low means for flexibility and damage control indicate room to improve execution.

Supply chain performance was associated with demand fulfillment with a coefficient of 0.768, whereas the direct relationship between management effectiveness and demand fulfillment was 0.125 after performance was included. Together, management effectiveness and performance explained 76.4% of the variance in demand fulfillment. This pattern indicates that service outcomes were more closely associated with operational execution than with management directly in the estimated model. Customers experience outcomes in the quantity and species of fish received, delivery time, and service consistency. Information and plans therefore need to be translated into procurement, storage, and distribution activities that can adapt to requirements.

Table 4. *Specific indirect effects tested in the model*

Mediation path	Coefficient	t	p
X1 → Y → Z1	0.366	10.489	< 0.001
X2 → Y → Z1	0.369	8.675	< 0.001
X1 → Y → Z2	0.055	2.191	0.028
X2 → Y → Z2	0.056	2.179	0.029
Y → Z1 → Z2	0.633	10.677	< 0.001

Note: Construct notation follows Table 3. Coefficients represent specific indirect effects; the serial paths X1/X2 → Y → Z1 → Z2 are not included. Source: LISREL estimation results.

All indirect effects in Table 4 were positive and significant. Product quality and supply availability were associated with performance through management effectiveness with coefficients of 0.366 and 0.369, respectively. The small difference again indicates similar estimates for the two input conditions. Indirect effects on demand fulfillment through management effectiveness alone were smaller: 0.055 for product quality and 0.056 for supply availability. These are specific effects along the respective paths and do not encompass all possible sequences of relationships in the model.

The most prominent mediation finding concerned management effectiveness and demand fulfillment through performance, with an indirect coefficient of 0.633. For the same pair of constructs, the direct relationship remained positive and significant at 0.125. Performance therefore exhibited complementary partial mediation. Adding the direct and indirect coefficients yields a total effect of approximately 0.758. This figure summarizes rounded coefficients and is not a separately tested total-effect significance result. Full or partial mediation was not classified for the other four paths because

direct paths from product quality and supply availability to performance or demand fulfillment were not estimated.

From a dynamic capabilities perspective, this mediation pattern is consistent with the need to connect resource coordination with the ability to execute and adjust operations (Teece et al., 1997; Teece, 2007). This interpretation does not establish the presence of a measured dynamic capability, but helps explain why planning needs to be accompanied by operational action. Supply chain agility research also provides a basis for attention to flexibility in responding to change (Swafford et al., 2006). In capture-fish markets, adjustments to volume, capacity, and schedules are relevant when supplies fluctuate or products require additional handling.

The managerial implication is to connect joint decisions with measures of execution and order outcomes. Businesses can update information on quality, actual arrivals, inventories, and customer needs to inform procurement and product allocation. These decisions should be followed by arrangements for storage and transport capacity, fish-handling procedures, and alternative suppliers during shortages. Performance can be monitored through processing time, the ability to adjust volumes or schedules, and the quantity of damaged or rejected products. These outcomes should then be compared with order completeness and delivery timeliness. These actions are recommendations based on the results and were not tested as interventions in this study.

The study is limited by its cross-sectional design and reliance on respondents' assessments. The temporal sequence of changes was not observed, so structural coefficients do not establish temporal causation. Measurement using the same questionnaire source also leaves room for common method bias. The findings apply to the accessible population and businesses analyzed; demand fulfillment does not measure aggregate fish requirements among Bandung residents. The model did not compare coefficients across business groups or test prediction in other periods. Further research can employ longitudinal data, actual order and damage records, alternative models, and serial mediation tests. Reporting discriminant validity and assessing common method bias would strengthen the evaluation of construct distinctiveness.

CONCLUSION

Product quality and supply availability were positively associated with capture-fish supply chain management effectiveness in Bandung, with nearly identical coefficient magnitudes. Management effectiveness was strongly associated with performance, and performance was strongly associated with demand fulfillment. Performance partially mediated the relationship between

management effectiveness and demand fulfillment, while the indirect effects of product quality and supply availability through management effectiveness were also positive and significant on the tested paths. The main finding identifies operational execution as an important link between coordination and customer service outcomes.

Respondents assessed product conditions, supply, and management more favorably than performance and order fulfillment. Improvement should focus on storage and transport flexibility, damage control, certainty of arrival schedules, and order completeness. These relationships are interpreted within the scope of a single-period survey and business assessments, and therefore do not establish causal ordering or the extent to which aggregate capture-fish demand in Bandung is fulfilled. Data collected over time and actual operational measures can test the consistency of the findings and clarify the mechanisms involved.

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