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Rotate to Elevate: Examining Job Rotation and Teamwork Effects on Employee Performance in Port Management Industry

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Abstrak
Port management organizations face performance optimization challenges that require strategic human resource interventions. This quantitative research examines the influences of job rotation and teamwork on employee performance within the Indonesian port industry context. Employing census sampling of 123 employees at PT PCM—a regional government-owned port enterprise in Cilegon—data were collected through validated questionnaires and analyzed using multiple linear regression. Findings reveal that job rotation demonstrates significant positive effects on performance ($\beta = 0.865$, $p < 0.001$), indicating that systematic position changes enhance employee competencies and adaptability. Teamwork exhibits a positive but non-significant relationship with performance ($\beta = 0.138$, $p = 0.196$), suggesting that collaborative processes require additional mediating factors to translate into performance gains. The combined variables explain 62.6% of performance variance ($R^2 = 0.626$), confirming the substantial contribution of human resource development strategies. This research contributes empirical evidence supporting job rotation as an effective performance enhancement mechanism in port management contexts, while revealing the complexity of teamwork that requires deeper investigation. Practical implications emphasize the implementation of strategic rotation programs and the examination of team effectiveness factors for optimizing port industry workforce performance. Study limitations include the single-organization focus and cross-sectional design, suggesting the need for longitudinal and multi-site investigations to enable broader generalization.

Keywords: Employee Performance, Job Rotation, Teamwork, Port Management, Human Resource Development

INTRODUCTION

Contemporary organizational environments characterized by intensifying global competition compel continuous productivity, efficiency, and innovation enhancement (Bashiru, 2023; Kalandarovna & Qizi, 2023; Ninduwezuor-Ehiobu et al., 2023). Performance optimization constitutes critical success factor, requiring both individual excellence and collective team effectiveness (Armstrong & Taylor, 2020). Human resource management research identifies multiple performance determinants, with job rotation and teamwork emerging as significant yet incompletely understood factors (Gallagher et al., 2023; Heriyati et al., 2024; Hingorani & Swami, 2025). Job rotation represents strategic human resource development approach systematically exposing employees to varied positions enhancing competencies through diversified experiences (Campion, Cheraskin, & Stevens, 1994). Conversely, teamwork embodies collaborative capacity enabling collective achievement exceeding individual contributions (Katzenbach & Smith, 2015).

Global maritime logistics faces unprecedented performance pressures as container throughput volumes surge, technological automation accelerates, and competitive dynamics

intensify across interconnected port networks worldwide. According to the United Nations Conference on Trade and Development (UNCTAD, 2023), global container port traffic reached 865 million twenty-foot equivalent units (TEUs) in 2022, reflecting continued expansion despite supply chain disruptions, yet port operational efficiency varies dramatically across regions with many facilities struggling to meet demand surges, minimize vessel turnaround times, and optimize labor productivity.

The World Bank's Container Port Performance Index (2023) reveals significant performance disparities: while leading Asian ports achieve container handling rates exceeding 100 moves per hour per berth, many emerging market ports operate at 50% of this benchmark, highlighting substantial efficiency gaps that translate directly into economic competitiveness differentials for regional trade. In the Southeast Asian context specifically, port performance challenges are particularly acute: the ASEAN Economic Community's ambitious connectivity targets require coordinated maritime infrastructure development and operational excellence, yet persistent workforce skill gaps, high employee turnover rates averaging 15-20% annually in the logistics sector, and limited systematic human resource development practices constrain performance improvement efforts (ASEAN Secretariat, 2022).

Moreover, research by the International Labour Organization (2021) documents that port industry workforce performance is increasingly contingent not merely on technical competencies but on adaptive capabilities—the capacity to master multiple operational roles, collaborate effectively across functional boundaries, and continuously upgrade skills in response to technological change. These global trends underscore why employee performance optimization in port management contexts represents not merely an organizational concern but a strategic imperative with direct implications for national economic competitiveness, supply chain resilience, and regional development trajectories.

This research investigates PT PCM, regional government-owned enterprise (BUMD) managing port operations in Cilegon City, Banten Province, Indonesia. Cilegon hosts over 30 industrial ports supporting regional economic development, positioning PT PCM strategically within Indonesia's maritime logistics infrastructure. Company management structures performance assessment across four domains: financial performance, service delivery performance, operational performance, and human resource administration performance, each monitored through specific key performance indicators (KPIs). Preliminary analysis reveals performance fluctuations across KPI dimensions, particularly concerning human resource administration indicators including supervision follow-up completion rates, employee competency development, and periodic reporting accuracy.

Performance variability within human resource administration domain indicates management effectiveness challenges potentially undermining organizational goal achievement. Exploratory interviews with PT PCM management revealed job rotation implementation as performance improvement strategy targeting employees demonstrating suboptimal performance in specific functional areas. Additionally, organizational culture emphasizes teamwork, creating adaptation challenges as periodic rotation necessitates colleague group changes requiring continuous relationship rebuilding and coordination pattern adjustment. These dynamics suggest job rotation and teamwork as potentially critical yet insufficiently examined performance determinants within this organizational context.

Empirical literature presents inconsistent findings regarding these relationships, revealing critical gaps requiring further investigation. Regarding job rotation, studies demonstrate divergent results across contexts. Research supporting positive effects includes Ambarwati et al. (2023), who examined 247 SME employees in Indonesia finding job rotation significantly enhanced performance ($\beta=0.412$, $p<0.001$) through skill diversification and monotony reduction, with effects mediated by employee engagement. Similarly, Antoro and Widiastuti (2023) studied 156 customs officials in Yogyakarta documenting that rotation positively influenced performance ($\beta=0.358$, $p<0.01$) with job satisfaction as mediating mechanism, suggesting rotation's psychological benefits complement skill development. Conversely, contradictory evidence appears in Ngatimun (2023), who analyzed 89 manufacturing employees finding job rotation exhibited non-significant direct performance effects ($p=0.147$) unless mediated by motivation, implying rotation alone insufficient without motivational alignment.

Idris and Wahyudi (2021) reinforced this pattern studying 134 financial service employees, reporting rotation's performance impact conditional on work motivation levels (interaction effect $p=0.032$), suggesting contextual contingencies moderate rotation effectiveness. Regarding teamwork, literature similarly presents mixed findings. Studies documenting positive effects include Setyawan et al. (2021), who examined 203 retail employees demonstrating teamwork cooperation significantly influenced performance ($\beta=0.441$, $p<0.001$) when mediated by employee engagement, highlighting collaborative processes' motivational benefits. Elvina and Heriyanto (2024) studied 78 marketing support staff finding teamwork positively affected performance ($\beta=0.392$, $p<0.01$) through enhanced communication and coordination. However, conditional findings emerge from Octavia and Budiono (2021), who analyzed 165 service employees revealing teamwork's performance effects fully mediated by job satisfaction (direct effect $p=0.284$, indirect effect $p<0.001$), suggesting teamwork influences performance through psychological pathways rather than directly.

Mendonca et al. (2020) reinforced mediation patterns studying 187 employees across sectors, finding teamwork affected performance indirectly through employee engagement rather than directly, implying collaborative effectiveness requires enabling conditions. These inconsistencies reveal critical research gaps: (1) limited understanding of job rotation and teamwork performance mechanisms in specialized technical industries like port management where operational complexity and safety requirements create unique contexts; (2) insufficient examination of how rotation and teamwork interact, particularly whether rotation-induced team membership changes undermine collaborative effectiveness; (3) lack of integrated models testing both practices simultaneously within single organizational settings enabling relative effect comparison; and (4) scarce evidence from Indonesian maritime logistics sector despite industry's strategic economic importance and distinctive workforce characteristics including technical specialization, hierarchical structures, and safety-critical operations.

Therefore, this research is urgently needed to address both theoretical and practical imperatives with immediate relevance to port industry stakeholders. First, from a theoretical perspective, the inconsistent empirical findings regarding job rotation and teamwork performance effects demand contextual investigation to identify boundary conditions, mediating mechanisms, and interaction effects that explain when and how these practices

enhance performance—knowledge gaps that limit human resource theory's predictive utility and practical application guidance. Second, from an industry perspective, Indonesian port sector faces acute performance optimization pressures as ASEAN economic integration intensifies competition, e-commerce growth drives cargo volume surges, and automation investments require workforce adaptability—yet systematic evidence guiding human resource strategy in this specific context remains scarce, leaving managers without empirical foundation for intervention design. This convergence of theoretical gaps, industry pressures, organizational needs, policy responsibilities, and workforce development imperatives establishes the urgent necessity for rigorous empirical investigation of job rotation and teamwork performance effects within Indonesian port management contexts.

The novelty of this research manifests in four distinct dimensions that collectively distinguish it from existing scholarship and generate original contributions. First, this study represents the first comprehensive empirical examination of job rotation and teamwork performance effects specifically within Indonesian port management industry context, addressing a critical evidence gap given the sector's strategic economic importance (contributing 5.2% of national GDP and employing over 800,000 workers according to Indonesia Port Corporation, 2023) yet minimal representation in human resource management literature. While previous studies have examined rotation and teamwork in manufacturing, retail, and service sectors, port operations present unique characteristics—technical complexity of cargo handling equipment, safety-critical procedures requiring certification and standardization, 24/7 operational schedules demanding shift coordination, and hierarchical organizational structures balancing bureaucratic control with operational flexibility—that create distinctive contexts requiring dedicated investigation rather than generalizing from other industries. Second, the research employs an integrated analytical approach simultaneously testing both job rotation and teamwork effects within a unified model applied to the same organizational population, enabling direct comparison of relative effect magnitudes, assessment of potential interaction effects, and examination of combined explanatory power—an analytical strategy rarely employed in previous studies that typically examine these practices in isolation, thereby obscuring potential synergies or conflicts between practices.

The objectives of this research are threefold, with corresponding theoretical and practical benefits. First, to empirically examine and quantify the effect of job rotation on employee performance within PT PCM's port management context, determining whether systematic position rotation enhances performance as predicted by human capital theory and experiential learning frameworks, and if so, estimating effect magnitude to guide intervention prioritization. This objective contributes theoretical benefits by testing rotation theory's applicability in specialized technical contexts where safety requirements and operational complexity may moderate effects differently than in previously studied industries, while providing practical benefits through evidence-based guidance for rotation program design, implementation timing, and expected performance returns informing managerial decision-making. This objective provides theoretical benefits by quantifying human resource practice effects relative to unexplained variance attributable to other potential determinants (leadership, compensation, technology, individual differences), informing theoretical model development priorities, while generating practical benefits by establishing realistic performance

improvement expectations from human resource interventions and identifying whether additional complementary practices warrant investigation for comprehensive performance optimization strategies.

METHOD

This research employed a quantitative approach with an explanatory design to examine causal relationships among variables (Creswell & Creswell, 2018). A cross-sectional survey methodology enabled systematic data collection at a single time point, providing efficiency while establishing relationship patterns. The research context was *PT PCM*, a regional government-owned port management enterprise located in Cilegon City, Banten Province, Indonesia. As a strategic maritime infrastructure operator managing industrial port facilities that support regional economic development, *PT PCM* provided a relevant context for examining human resource practices within a specialized technical service industry. The organization implemented a structured performance management system that monitored financial, service, operational, and human resource administration domains through quantitative key performance indicators.

The research population comprised all 123 permanent employees of *PT PCM* across organizational functions and hierarchical levels. Given the manageable population size and the research objective of establishing a comprehensive organizational understanding, census sampling (total sampling) was employed, including the entire population as the research sample (Sugiyono, 2019). This approach eliminated sampling error, maximized statistical power, and enabled complete population parameter estimation—particularly valuable for organizational diagnosis and intervention planning purposes. All 123 employees received questionnaires, with a 100% response rate achieved through management support, direct distribution-collection procedures, and emphasis on confidentiality and voluntary participation.

The research examined three main variables: (1) job rotation (X_1) as an independent variable, operationalized through indicators including rotation frequency, position variety, preparation quality, learning opportunities, and skill development (adapted from Campion et al., 1994); (2) teamwork (X_2) as an independent variable, measured through communication effectiveness, goal clarity, mutual support, role understanding, and collaborative problem-solving dimensions (adapted from Katzenbach & Smith, 2015); and (3) employee performance (Y) as the dependent variable, assessed through task quality, work quantity, timeliness, efficiency, and continuous improvement indicators (adapted from Mathis & Jackson, 2019). All constructs were measured using validated multi-item scales employing a 10-point Likert format (1 = strongly disagree to 10 = strongly agree), providing enhanced response variance and statistical discrimination compared to traditional 5-point scales (Dawes, 2008).

Data collection proceeded through structured questionnaire administration following established protocols. Instrument development involved a literature review, expert consultation, and pilot testing to ensure content validity and respondent comprehension. Questionnaires were distributed directly to employees, with a completion time of approximately 15–20 minutes. Participation confidentiality was ensured through anonymous response coding and aggregate reporting. Data quality was verified through validity testing (correlating item scores with construct totals, accepting items $r > 0.177$at $\alpha = 0.05$) and reliability testing (calculating Cronbach's alpha, accepting constructs $\alpha > 0.70$) (Hair et al.,

2019). All measurement scales demonstrated satisfactory psychometric properties, meeting established criteria.

Data analysis employed multiple linear regression to examine the effects of independent variables on the dependent variable, specified as:

$$Y = \alpha + \beta_1 X_1 + \beta_2 X_2 + \varepsilon$$

where Yrepresents employee performance, X_1job rotation, X_2teamwork, $\alpha$the constant term, $\beta$the coefficients, and $\varepsilon$the error term. Analysis proceeded through: (1) descriptive statistics summarizing variable distributions; (2) validity and reliability assessment ensuring measurement quality; (3) classical assumption testing verifying normality (Kolmogorov-Smirnov test), absence of multicollinearity (VIF < 10), and homoscedasticity; (4) regression estimation using ordinary least squares; and (5) hypothesis testing through t-tests (partial effects), F-test (simultaneous effect), and R^2(variance explanation). The statistical significance threshold was established at $\alpha = 0.05$. Analyses were conducted using SPSS version 25.0.

RESULTS AND DISCUSSION

Measurement Quality Assessment

Validity testing through corrected item-total correlations revealed all measurement items exceeded minimum threshold (r=0.177, df=121, α=0.05): Job Rotation items ranged 0.389-0.649; Teamwork items ranged 0.599-0.733; Employee Performance items ranged 0.305-0.786. These results confirm all indicators validly measure intended constructs. Reliability assessment through Cronbach's alpha demonstrated: Job Rotation α=0.756 (reliable), Teamwork α=0.829 (very reliable), and Employee Performance α=0.782 (reliable), all exceeding minimum threshold (α>0.70). These findings establish measurement instruments possess adequate psychometric properties supporting subsequent analyses.

Classical Assumption Tests

Normality testing using Kolmogorov-Smirnov yielded asymptotic significance 0.505 (p>0.05), confirming residual normal distribution assumption satisfaction. Multicollinearity assessment through variance inflation factors revealed VIF=1.328 (VIF<10) with tolerance=0.753 (tolerance>0.10) for both independent variables, indicating multicollinearity absence. These results verify regression model satisfies ordinary least squares assumptions enabling unbiased, efficient parameter estimation and valid statistical inference.

Regression Results and Hypothesis Testing

Multiple regression analysis produced model: $Y = 9.919 + 0.865X_1 + 0.138X_2$. Job rotation coefficient β_1=0.865 demonstrates substantial positive effect, with t=6.701 (p<0.001) confirming statistical significance exceeding critical value (t>1.98, α=0.05). These results support H1: job rotation positively and significantly influences employee performance. Each unit increase in job rotation practices associates with 0.865-unit performance enhancement, indicating well-implemented rotation programs substantially elevate employee performance levels. Conversely, teamwork coefficient β_2=0.138 indicates positive direction but t=3.314 (p=0.196>0.05) reveals non-significant effect, failing to support H2. While teamwork demonstrates positive tendency, effect does not reach statistical significance threshold at conventional alpha level.

Simultaneous effect testing through F-statistic yielded F=36.761 (p<0.001), substantially exceeding critical value (F>3.07, α=0.05), confirming job rotation and teamwork jointly significantly influence employee performance. Model determination coefficient R^2=0.626 indicates independent variables collectively explain 62.6% performance variance, demonstrating substantial explanatory power. Remaining 37.4% variance reflects unmeasured

factors potentially including leadership quality, compensation systems, organizational culture, and individual characteristics. Overall, results establish job rotation as significant performance driver while teamwork demonstrates positive but non-significant direct effect within this organizational context.

Job rotation's significant positive performance effect aligns with Human Capital Theory predictions and empirical evidence (Ambarwati et al., 2023; Antoro & Widiastuti, 2023). Within PT PCM context, rotation effectiveness likely derives from multiple mechanisms. First, skill diversification: exposure to varied port operations functions (cargo handling, documentation, equipment maintenance, customer service) broadens competency portfolios enabling flexibility and cross-functional understanding. Second, monotony reduction: periodic position changes prevent performance degradation from routine repetition particularly relevant for repetitive operational tasks. Third, perspective broadening: experiencing different organizational units enhances systemic thinking and inter-functional coordination capabilities valuable for integrated port operations. Fourth, career development: rotation signals developmental investment enhancing motivation and organizational commitment.

Teamwork's non-significant direct performance effect contrasts with several previous studies (Setyawan et al., 2021; Elvina & Heriyanto, 2024) while aligning with others documenting conditional effects (Octavia & Budiono, 2021; Mendonca et al., 2020). This finding suggests several possibilities. First, measurement timing: cross-sectional design captures single-moment snapshot potentially missing teamwork's cumulative long-term effects. Second, mediating mechanisms: teamwork may influence performance indirectly through satisfaction, engagement, or commitment rather than directly—pathways not examined in this model. Third, team maturity variation: port operations involve both stable long-term teams and temporary task-based groupings exhibiting varying effectiveness levels potentially averaging to non-significant aggregate effect. Fourth, rotation disruption: frequent position changes necessitating team reintegration may temporarily diminish teamwork effectiveness as employees repeatedly navigate new relationship dynamics and coordination patterns.

Combined variables' substantial explanatory power (R^2=0.626) indicates human resource development practices significantly shape performance outcomes, confirming strategic importance of rotation program design and team management. Findings emphasize differentiated intervention priorities: job rotation emerges as high-impact practice meriting continued investment and optimization, while teamwork requires deeper investigation identifying effectiveness conditions and potential mediating pathways. For port management contexts specifically, results suggest rotation's skill-building and boredom-reduction benefits particularly valuable given technical complexity and operational routine characteristics, while effective teamwork may require additional enabling factors including stable team configurations, clear communication protocols, and supportive leadership not yet fully established.

CONCLUSION

This research establishes three primary conclusions. First, job rotation significantly and positively influences employee performance (β=0.865, $p<0.001$), confirming systematic position rotation as effective performance enhancement mechanism through skill diversification, monotony reduction, and career development facilitation. Second, teamwork demonstrates positive but non-significant direct performance effect (β=0.138, $p=0.196$), suggesting collaborative effectiveness requires additional conditions or operates through indirect pathways warranting further investigation. Third, combined human resource development practices substantially influence performance explaining 62.6% variance (R^2=0.626, $F=36.761$, $p<0.001$), underscoring strategic importance of integrated human

resource management approaches. Findings contribute empirical evidence advancing job rotation and teamwork performance relationships understanding within port management industry context, providing foundation for both theoretical development and practical application. Research findings generate actionable implications for human resource management practice. Organizations should: (1) implement systematic job rotation programs with clear objectives, structured preparation, and adequate support ensuring positive learning experiences rather than disruptive transitions; (2) align rotation timing and position sequences with career development pathways maximizing skill-building while maintaining operational continuity; (3) provide rotation-related training including technical preparation, adaptation support, and knowledge transfer mechanisms facilitating smooth transitions; (4) monitor rotation program effectiveness through performance tracking, participant feedback, and continuous improvement processes; and (5) investigate teamwork enhancement strategies including team composition optimization, communication protocol clarification, goal alignment reinforcement, and supportive leadership development addressing factors enabling collaborative effectiveness. For port management specifically, rotation programs should balance technical skill development across diverse operational functions with sufficient position tenure enabling expertise consolidation, while team management should address challenges from rotation-induced membership changes through explicit relationship-building initiatives and coordination mechanisms. Research limitations suggest future investigation directions. First, single-organization focus limits generalizability multi-site studies across diverse port operations contexts would enhance external validity and pattern identification across organizational characteristics. Second, cross-sectional design captures single-moment relationships longitudinal approaches tracking employees through rotation cycles would reveal temporal dynamics, adaptation processes, and long-term cumulative effects. Third, exclusive quantitative methodology provides statistical rigor but limits mechanistic understanding mixed-methods designs incorporating qualitative interviews and observational data would illuminate processes underlying statistical relationships. Fourth, direct effects model excludes potential mediators examining satisfaction, engagement, commitment, and learning as intervening mechanisms would clarify causal pathways. Fifth, aggregate teamwork measurement obscures within-team variation multilevel modeling distinguishing individual perceptions from team-level properties would refine understanding. Future research addressing these limitations through diverse designs, methods, contexts, and analytical approaches would substantially advance theoretical knowledge while providing richer practical guidance for human resource management optimization in port management and related industries.

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