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The relationship of participative leadership and psychological safety on employee performance: a case study at PT Suprabakti Mandiri

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ABSTRACT

This study investigates the relationships between participative leadership, psychological safety, and employee performance at PT Suprabakti Mandiri, an engineering services and maintenance company operating in a high-risk, quality-sensitive environment. Using a quantitative, cross-sectional correlational design, data were collected from 270 employees across core operational departments via an online structured questionnaire. Instrument quality was confirmed through item validity testing, where all items exceeded the critical correlation threshold, and reliability analysis, which indicated strong internal consistency for participative leadership ($\alpha \approx 0.85$ 0.87), psychological safety ($\alpha \approx 0.70$ 0.73), and employee performance ($\alpha \approx 0.77$ 0.79) constructs. Classical assumption tests supported the suitability of linear regression, with residuals normally distributed, no multicollinearity (VIF = 1.281), no heteroscedasticity, and linear relationships between the predictors and outcomes. The regression results show that participative leadership is positively and significantly associated with employee performance ($p < 0.001$; $R^2 = 0.254$). Psychological safety also demonstrated a positive and significant relationship with employee performance and explained a larger share of variance ($p < 0.001$; $R^2 = 0.392$). When tested jointly, participative leadership and psychological safety remained significant predictors and collectively explained 44.9% of the performance variance ($p < 0.001$; $R^2 = 0.449$), with psychological safety showing a stronger standardized effect. These findings suggest that improving leadership participation and strengthening psychological safety may enhance performance consistency and support efforts to reduce recurring non-conformance outcomes in contractor-based engineering operations.

Keywords: employee performance; non-conformance reports; participative leadership; psychological safety

1. INTRODUCTION

Employee performance remains a central determinant of organizational success and long-term viability, particularly in markets where firms compete on speed, quality, and reliability. As competition intensifies, organizations are compelled to deliver high-quality products and services while maintaining efficiency and operational excellence. These demands make workforce capability, productivity, work quality, initiative, and consistent execution strategic assets rather than purely operational concerns. As day-to-day outcomes are shaped by how employees interpret priorities, coordinate across roles, and respond to problems in real-time, leadership is a key mechanism through which organizations translate strategy into performance. Leaders set the direction, influence motivation, and shape the climate that supports learning and collaboration (Northouse, 2022).

Among leadership approaches, participative leadership has received increasing attention because of its emphasis on involvement and shared decision-making. Rather than relying primarily on top-down instructions, participative leaders encourage employees to contribute ideas, communicate openly, and collaborate to solve operational issues (Somech & Wenderow, 2006). This approach is expected to strengthen ownership and accountability because employees are not treated solely as implementers but as partners in improving work processes. Evidence also suggests that participative leadership is associated with stronger motivation, trust, and work quality, making it relevant for human capital management in performance-focused organizations (Wang et al., 2022). In technical service environments, where tasks are complex, interdependent, and time-sensitive, these benefits may be particularly valuable because performance depends not only on individual skills but also on cross-functional coordination and timely problem escalation.

Although prior studies have established that leadership matters for employee outcomes, there remains an important gap in the literature regarding how participative leadership operates together with psychological safety in contractor-based engineering environments. Much of the existing research tends to examine leadership style and employee performance directly or psychological safety and team outcomes separately, often in general organizational, educational, healthcare, or manufacturing settings. Consequently, limited attention has been paid to whether participative leadership and psychological safety should be analyzed jointly in project-based industrial service firms, where performance depends on coordination across functions, strict compliance, and employees' willingness to speak up under operational pressure.

This study is situated within Indonesia's industrial and mining service landscape, which has expanded with broader national economic development. Employee performance is becoming increasingly critical in this sector because operational demands include strict client requirements, heightened safety expectations, and complex technical requirements. From a national perspective, the industrial sector will contribute approximately 18.5% of Indonesia's GDP in 2022, indicating its continued importance (Badan Pusat Statistik, 2022). At the firm level, organizations in industrial and mining services must continuously improve workforce productivity while sustaining compliance, effectiveness, and safety (Suharto & Kurniawan, 2021). In such settings, performance variations are costly because they can translate directly into rework, delays, and reputational risks.

PT. Suprabakti Mandiri operates in this environment as a provider of engineering services, conveyor systems, and maintenance solutions serving mining and industrial clients across Indonesia. Their work is characterized by technically demanding tasks, strict safety requirements, and coordination across multiple functions and sites. The company's operational expectations align with internationally recognized management standards and emphasize "zero harm" and high compliance, reflecting an organizational focus on safety and quality. However, as project complexity increases, organizations face growing pressure to maintain consistent performance across departments and teams. Early internal observations indicate performance disparities, including inconsistent productivity and uneven work quality, which may signal gaps in leadership practices and the broader work climate.

Previous research supports the relevance of participative leadership in improving employee outcomes across industries. Studies suggest that involving employees in decisions can enhance

engagement, initiative, and problem-solving behaviors that are closely tied to productivity and job performance (Usman et al., 2021). These findings imply that participative leadership, such as PT, may be especially beneficial for firms. Suprabakti Mandiri, where project delivery depends on rapid coordination, disciplined execution, and continuous improvement under technical constraints. Simultaneously, leadership alone may not fully explain performance differences in high-risk team-based environments. Psychological safety has emerged as a critical construct in organizational behavior research, particularly in contexts requiring collaboration, knowledge exchange, and quick problem-solving. Psychological safety refers to the shared belief that the workplace supports interpersonal risk-taking. Employees feel able to speak up, ask questions, report mistakes, and raise concerns without fear of embarrassment or negative consequences (Edmondson, 1999). When psychological safety is present, teams tend to show stronger learning behaviors and more proactive coordination, which are essential for complex operations and safety-critical tasks.

In industrial engineering and maintenance settings, psychological safety is not simply a "soft" factor; it can influence operational reliability and risk control. Technical work frequently depends on timely hazard reporting, cross-departmental coordination, and open communication to prevent defects and accidents. Empirical research indicates that psychologically safe environments encourage employees to report hazards and errors, improving coordination and reducing adverse outcomes (Frazier et al., 2017; Newman et al., 2017). Conversely, climates characterized by fear or silence can undermine decision quality, reduce initiative, and delay the escalation of emerging problems (Liang et al., 2012). Initial indications were obtained within PT. Suprabakti Mandiri suggest some employees may hesitate to raise concerns or provide feedback due to fear of negative reactions, creating conditions where communication breakdowns and unreported risks may persist. Leadership behavior is also linked to the creation of psychological safety. Inclusive and supportive leaders tend to foster a climate in which employees feel comfortable expressing their ideas and concerns (Edmondson & Lei, 2014). Participative leadership is theorized to promote psychological safety by normalizing voice, distributing responsibility, and encouraging involvement (Detert & Burris, 2007). This interdependence suggests that examining participative leadership and psychological safety may provide a more complete explanation of employee performance than assessing leadership alone.

The academic gap becomes more specific in the Indonesian contractor-based engineering context. Existing studies rarely explain why participative leadership and psychological safety need to be studied together in organizations characterized by multisite operations, tight deadlines, client-driven standards, and hierarchical supervision structures. In such environments, employee performance is not shaped only by technical competence but also by whether workers feel invited to participate in decisions and safe enough to raise operational concerns, report errors, and suggest improvements. However, this combined mechanism remains underexplored in Indonesian industrial service firms, particularly those operating as contractors in mining and engineering support activities.

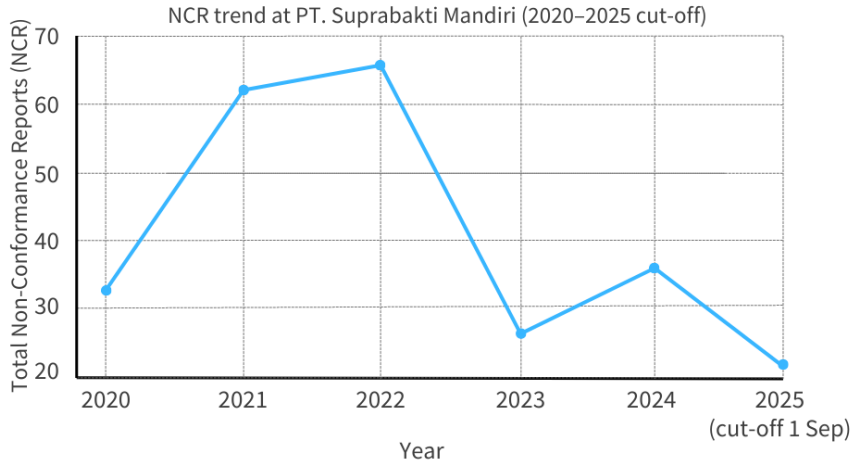

Figure 1. NCR Trend (2020-2025 cut-off)

The practical urgency of this issue is visible in the quality outcomes at PT. Suprabakti Mandiri, particularly through Non-Conformance Reports (NCRs), which reflect deviations from quality standards that trigger rework and corrective actions. NCR records from 2020 to 2025 show notable fluctuations (e.g., increases from 32 in 2020 to 61 in 2021 and 64 in 2022, followed by a decline to 26 in 2023 and a rise to 36 in 2024; as of September 1, 2025, 22 NCRs have already been recorded) (see Figure 1). At the project level, the concentration of NCRs in specific conveyor fabrication activities (e.g., the Pani Gold Project) suggests that the underlying drivers may include not only technical complexity but also behavioral and organizational factors, such as coordination, supervision, communication, and willingness to report issues early. Accordingly, this study investigates the relationships between participative leadership (X1), psychological safety (X2), and employee performance (Y) at PT. Suprabakti Mandiri. By integrating leadership and psychological climate perspectives, this study aims to generate evidence that can inform leadership development, team practices, and communication norms to support operational excellence and reduce quality deviations in a contractor-based industrial services context.

Accordingly, this study contributes to the literature in two ways. First, it extends research on employee performance by integrating participative leadership and psychological safety within a single explanatory framework, rather than treating them as separate determinants. Second, it provides evidence from an Indonesian contractor-based engineering and industrial services setting, a context that remains less visible in mainstream organizational behavior research despite its high operational risk and strong dependence on coordination, compliance, and upward communication. By doing so, the study seeks to clarify not only whether participative leadership and psychological safety matter, but why their interaction is especially relevant for employee performance in technically demanding project environments.

2. LITERATURE REVIEW

Employee performance is a key determinant of organizational effectiveness because it reflects how well employees translate work expectations into reliable outputs and contribute to broader organizational goals. In contractor-based and technically demanding environments, performance is not shaped solely by technical competence, but also by coordination, communication, adaptability, and the work climate that supports timely problem solving and consistent execution (As'ad et al., 2023). This is particularly relevant in engineering and maintenance operations, where weak coordination and delayed communication can lead to rework, quality deviations, and operational disruptions.

2.1. Participative Leadership and Employee Performance

Participative leadership refers to a leadership approach in which employees are involved in decision-making, problem solving, and work improvement processes, while leaders remain responsible for direction and final outcomes. This style emphasizes open communication, shared responsibility, and employee involvement, which can strengthen engagement, ownership, and accountability in daily work (Somech & Wenderow, 2006; Koene et al., 2002). In project-based and interdependent work settings, such behaviors are particularly relevant because performance depends on how effectively employees coordinate, respond to problems, and contribute to operational knowledge.

The relationship between participative leadership and employee performance can be explained using the social exchange theory. When leaders show trust, openness, and respect by involving employees in decisions, employees are more likely to reciprocate through stronger effort, commitment, and performance (Blau, 1964). Behavioral leadership theory also supports this argument by emphasizing that leadership outcomes are shaped by observable leader behaviors, including consultation, encouragement, and two-way communication. In technically demanding settings, participative leadership can improve not only motivation but also the quality of judgment and execution under complex conditions. Empirical studies also show that participative leadership is associated with stronger work quality, initiatives, and employee performance (Wang et al., 2022; Usman et al., 2021).

Accordingly, we propose the following hypothesis:
H1: Participative leadership positively affects employee performance.

2.2. Participative Leadership and Psychological Safety

Psychological safety refers to the shared belief that employees can speak up, ask questions, report mistakes, and express concerns without fear of embarrassment, punishment, or other negative interpersonal consequences (Edmondson, 1999; Edmondson, 2018). In engineering and contractor-based operations, this condition is especially important because employees often need to communicate hazards, raise doubts, and escalate problems before they develop larger operational failures.

Leadership is consistently identified as one of the strongest antecedents of psychological safety. Leaders who encourage input, actively listen, and respond supportively help create a climate in which employees feel safe to voice ideas and concerns (Newman et al., 2017). This relationship can also be understood through Leader-Member Exchange Theory, which emphasizes that high-quality leader–employee relationships are characterized by trust, respect, and open communication (Graen & Uhl-Bien, 1995). Participative leadership fosters such relational quality by involving employees in decisions and validating their input. Consequently, employees are less likely to fear negative reactions when speaking up. In this way, participative leadership is expected to strengthen psychological safety by normalizing voice, consultation, and collaborative problem solving.

Accordingly, we propose the following hypothesis:
H2: Participative leadership positively affects employees' psychological safety.

2.3. Psychological Safety and Employee Performance

Psychological safety theory explains that employees and teams perform more effectively when they feel safe communicating openly, seeking help, and reporting mistakes, without fear of blame or humiliation (Edmondson, 1999; Edmondson, 2018). In high-risk and interdependent work environments, silence can be more damaging than errors themselves because unreported issues may escalate into quality failures, rework, or safety incidents. In contrast, psychologically safe environments encourage earlier error disclosure, better coordination, and more effective problem-solving.

This logic is also consistent with Job Demands Resources Theory, which views supportive work conditions as resources that help employees handle demanding tasks more effectively (Bakker & Demerouti, 2008). Psychological safety can be understood as a social resource because it reduces interpersonal strain and supports proactive behaviors, such as asking for clarification, sharing information, and reporting emerging risks. Empirical research has shown that psychological safety is positively associated with communication quality, learning behavior, proactive conduct, and performance outcomes across industries (Frazier et al., 2017; Newman et al., 2017). In technical environments, it is also linked to better reporting behavior and lower error concealment, both of which contribute to more reliable performance (Zhang & Song, 2020).

Accordingly, we propose the following hypothesis:
H3: Psychological safety positively affects employee performance.

2.4. Conceptual Framework

The reviewed literature indicates that participative leadership and psychological safety are theoretically and empirically connected to employee performance. Social Exchange Theory explains why participative leadership can stimulate reciprocal commitment and stronger work effort (Blau, 1964). Leader–member exchange theory clarifies how participative leadership behaviors build trust and openness in leader–employee relationships (Graen & Uhl-Bien, 1995). Psychological Safety Theory explains why employees perform better when they can report concerns and communicate without fear (Edmondson, 1999; Edmondson, 2018), whereas Job Demands Resources Theory shows how supportive leadership and a safe communication climate function as resources under demanding operational conditions (Bakker & Demerouti, 2008).

However, prior research has often examined these relationships separately, mostly in general organizational settings. Few studies have integrated participative leadership, psychological safety, and employee performance into contractor-based engineering and industrial service contexts, particularly in Indonesia. This study addresses this gap by examining these three variables within a single framework relevant to technically demanding and safety-sensitive operations.

Figure 2 presents the conceptual framework of this study. The model proposes that participative leadership (X1) positively influences employee performance (Y) and psychological safety (X2), whereas psychological safety (X2) positively influences employee performance (Y).

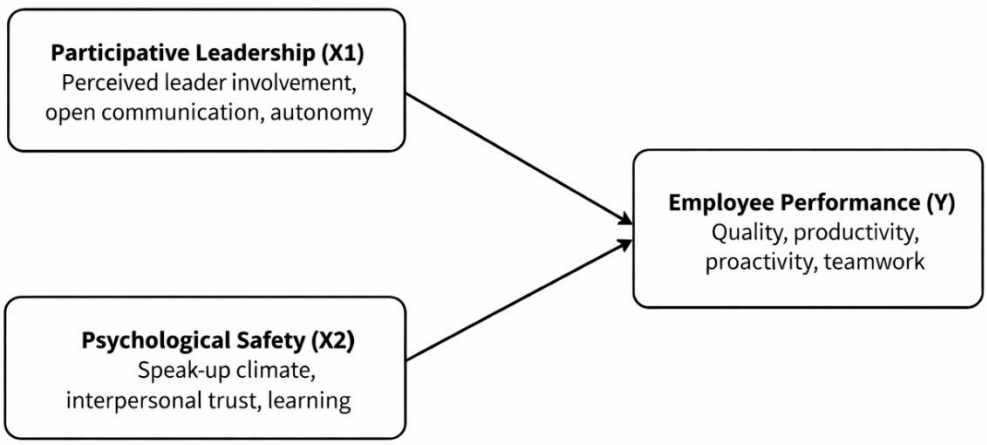

Figure 2. Conceptual Framework

Building on the convergence of theory and evidence, as shown in Figure 2, this study argues that participative leadership encourages reciprocal commitment and effort (Blau, 1964), strengthens high-quality leader–member relationships that reduce interpersonal fear (Graen & Uhl-Bien, 1995), and fosters psychological safety that enables learning, coordination, and error reporting (Edmondson, 1999; Edmondson, 2018). Empirical findings support these pathways, showing that psychological safety improves error reporting and communication in technical environments (Zhang & Song, 2020), while predicting performance and proactivity across contexts (Frazier et al., 2017). The integrated framework also implies mediation: empowerment from participative leadership may not improve performance unless employees feel psychologically safe to use their voice and autonomy. This aligns with evidence that psychological safety amplifies leadership effects on learning and communication effectiveness (Newman et al., 2017), supporting a model in which participative leadership (X1) shapes psychological safety (X2), and both contribute to employee performance (Y).

3. RESEARCH METHOD

3.1. Research Design and Approach

This study employed a quantitative, correlational survey design to examine the relationships between participative leadership (X1), psychological safety (X2), and employee performance (Y) based on employees' perceptions of these variables. The intent of the design was to test whether the relationships between these constructs were statistically significant and positive within the context of PT. Suprabakti Mandiri. Because the objective was to assess association patterns rather than to manipulate variables, this study used a non-experimental approach and did not attempt to establish causal effects. Data were collected using a cross-sectional strategy in which all variables were measured at a single point in time. This design is appropriate for organizational settings where leadership behaviors, psychological climate, and performance perceptions can be captured through standardized self-report measures to estimate the direction and strength of relationships within a naturally occurring work environment.

The research process began with an organizational problem diagnosis to ground the study in practical business issues. Internal operational observations suggested that variability in Non-Conformance Reports (NCRs) and differences in departmental outcomes could not be fully addressed through technical or procedural interventions alone. The preliminary diagnosis indicated that leadership practices and the psychological climate of teams might influence how effectively employees coordinate, report issues, and maintain quality in a contractor-based operational environment. Accordingly, the study framed the organizational challenge as partly behavioral and cultural, thereby justifying the selection of participative leadership and psychological safety as explanatory variables linked to employee performance.

3.2. Instrument Selection and Development Procedures

Measurement instruments were selected through an in-depth review of empirical and theoretical studies on participative leadership, psychological safety, and employee performance. Rather than constructing new instruments from scratch, this study adapted established questionnaires that have demonstrated acceptable validity and reliability in previous work. The adaptation approach was chosen to strengthen methodological rigor and comparability with the existing literature while still allowing wording adjustments that fit the organizational context. The items were compiled into a structured questionnaire and delivered online. All constructs were measured using a five-point Likert scale to capture respondents' levels of agreement with statements reflecting leadership behaviors, psychological safety conditions, and performance-related behaviors.

Participative leadership (X1) is the degree to which employees perceive their leaders as involving them in decision-making, encouraging open communication, actively seeking input, and supporting autonomy. The item sources were guided by established leadership and empowerment frameworks (Somech & Wenderow, 2006; Spreitzer, 1995; Yukl, 2012), and the final instrument consisted of 20 items. Psychological safety (X2) is the extent to which employees feel safe speaking up, asking questions, sharing ideas, and admitting mistakes without fear of negative consequences. This construct draws on foundational work on psychological safety and voice behavior (Detert & Burris, 2007; Edmondson, 1999; Edmondson & Lei, 2014; Kahn, 1990) and was measured using 20 items. Employee performance (Y) is employees' perceived effectiveness in carrying out job tasks in terms of quality, efficiency, proactivity, teamwork, communication, and timeliness, drawing on widely cited performance frameworks (Borman & Motowidlo, 1997; Dessler & Tan, 2006). Employee performance was assessed using 25 items in this study.

3.3. Data Collection, Population, and Sampling

Before large-scale data collection, the questionnaire was content-validated to ensure conceptual alignment and contextual suitability. First, expert judgment was used to evaluate item relevance, clarity, and appropriateness for Indonesian organizational settings. The experts included individuals familiar with leadership and human resource practices, as well as organizational conditions comparable to PT. Suprabakti Mandiri. This step followed the guidance that content validity should assess whether items adequately represent construct domains and fit the context of application (Lynn, 1986; Polit & Beck, 2006). After expert input, a readability test (pilot test) was conducted with a small group of employees who met the study inclusion criteria. The pilot aimed to confirm that the language, sentence structure, and terminology were clear and consistently interpreted by respondents. Feedback from the pilot informed minor revisions to ambiguous wording while preserving the conceptual meanings of each indicator. This two-stage validation approach was applied to reduce measurement error and improve the reliability of responses, consistent with recommendations for instrument refinement in survey research (Sekaran & Bougie, 2016).

The study population consisted of employees in the core business departments of PT. Suprabakti Mandiri, representing units directly involved in engineering services, fabrication, operations, quality assurance, and supporting functions. The population size of the targeted departments was N = 435. To determine the minimum sample size required to achieve adequate statistical power in a finite population,

the Slovin formula was applied using a margin of error of 5% (e = 0.05). This calculation indicated a minimum sample requirement of approximately n ≈ 209 participants. The final number of usable responses collected for analysis was n = 270, which exceeded the minimum threshold and was therefore considered sufficient for the regression-based analyses.

Respondents were selected based on the inclusion criteria to ensure that the data reflected current and relevant organizational experiences. Participants were required to be active employees at the time of the survey to avoid retrospective bias. They were also required to work in departments connected to the company's primary operational activities, including factory-related departments and closely related administrative and sales functions. Participation was voluntary and not compelled by management; only complete and consistent responses were included in the analysis. The sample also included employees from diverse levels, positions, and tenures, provided that they met the inclusion requirements, allowing the study to capture variations in perceptions across the organization.

Data collection was conducted after finalizing the questionnaire. The survey was distributed online using Google Forms because of its accessibility and practical advantages in managing response tracking and minimizing data entry errors. Participants were invited via e-mail and broadcast messages. Prior to answering, respondents received a brief explanation of the study purpose and were informed that participation was voluntary, responses would be anonymous, and the data would be used only for research. This procedure was intended to encourage honest responses and reduce social desirability bias.

After the survey was closed, the dataset was screened for completeness and consistency before statistical analysis. Patients with incomplete submissions were excluded. Responses showing extreme or suspiciously uniform patterns (such as selecting the same response option across nearly all items, for example, all 1s or all 5s) were reviewed and excluded when they indicated low response quality. These procedures were applied to reduce measurement errors and improve the accuracy of subsequent analyses, ensuring that only valid and interpretable responses were retained.

Instrument quality was evaluated using reliability and validity testing before hypothesis testing. Reliability refers to the consistency of items measuring the same construct. Following the guidance that reliable instruments produce consistent measurement outcomes (Sugiyono, 2020), internal consistency reliability was assessed using Cronbach's alpha. Values above 0.60 were considered acceptable reliability for this study. Validity testing assessed whether the items measured the constructs that they were intended to measure. Based on the validity guidance for behavioral research instruments (Ghozali, 2018), item validity was examined by comparing item scores with total construct scores using item total correlation and significance testing. Items were considered valid when the significance value (p-value) was < 0.05; items that failed this criterion were revised or removed from further analysis. All reliability and validity analyses were conducted using IBM SPSS Statistics (version 25).

3.4. Data Analysis Strategy

Multiple Linear Regression (MLR) was used as the main analytical technique to test the relationships between participative leadership (X1), psychological safety (X2), and employee performance (Y). Regression analysis was chosen because it provides a clear and interpretable method for estimating the contribution of multiple predictors to a single outcome variable in a correlational design. The regression model was specified as follows:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \varepsilon,$$

where Y represents employee performance, X_1 represents participative leadership, X_2 represents psychological safety, β_0 is the constant, β_1 and β_2 are regression coefficients, and ε is the error term. Statistical significance was evaluated at a 95% confidence level ($\alpha = 0.05$). The analysis tested whether higher perceptions of participative leadership and psychological safety were associated with higher reported employee performance and whether both predictors remained significant when tested simultaneously in the model.

Before interpreting the regression coefficients, classical assumption tests were conducted to verify that the regression model met the key statistical assumptions. The normality of the residuals was assessed using the one-sample Kolmogorov-Smirnov test with a significance threshold of 0.05,

supported by normal probability plots. Multicollinearity was evaluated using tolerance values and the Variance Inflation Factor (VIF), with VIF < 10 and tolerance > 0.1 indicating acceptable independence between predictors (Ghozali, 2018). Heteroscedasticity was examined to ensure that the residual variance was constant across the levels of predictors, as a well-specified regression model should not exhibit heteroscedasticity (Ghozali, 2018). Linearity was also tested to confirm that the relationships between predictors and outcomes could reasonably be modeled as linear; deviation-from-linearity significance values greater than 0.05 supported linearity. This study integrated statistical findings with relevant theory and organizational context to interpret how participative leadership and psychological safety relate to employee performance at PT. Suprabakti Mandiri. The interpretation emphasized practical meaning, in addition to statistical significance, linking the results to leadership practice, communication climate, and performance management realities in a contractor-based engineering organization.

4. RESULTS

4.1. Respondent Profile and Tenure Characteristics

A total of 270 usable responses were retained for analysis. Respondents represented a broad range of organizational tenures, indicating that the sample included employees with both relatively recent and long-standing exposure to the company's work system, managerial practices, and team climate. The minimum and maximum reported tenures were 6 months and 381 months (equivalent to 31 years and 9 months), respectively. This wide tenure range suggests that the dataset captured perspectives from employees who were still adapting to organizational routines and those who had extensive experience with the organization's leadership patterns and operational culture. In practical terms, this strengthens the confidence that responses were informed by sustained interaction with leaders and team processes rather than short-term impressions. The distribution also showed a notable concentration of employees joining in 2021, with 45 respondents reporting their start year as 2021, indicating that a sizeable segment of the workforce had accumulated several years of experience by the time the data were collected.

Table 1 presents the respondent characteristics of this study. The age distribution further reflected a predominantly early-career workforce, while still including older cohorts. Respondents ranged in age from under 24 years to over 58 years. The largest age category was 24 28 years (86 respondents; 31.85%), followed by 29 34 years (51 respondents; 18.89%). The under-24 group accounted for 45 respondents (16.67% of the total). Middle-age categories were present but smaller in size, including 39 44 years (36 respondents; 13.33%) and 35 38 years (18 respondents; 6.67%). Older categories were less represented, including 45 48 years (15 respondents; 5.56%), 49 54 years (14 respondents; 5.19%), 55 58 years (4 respondents; 1.48%), and > 58 years (1 respondent; 0.37%). Overall, the age pattern indicates that most respondents were in their 20s to early 30s, which is relevant when interpreting leadership and climate perceptions because younger employees may be more sensitive to communication tone, feedback opportunities, and psychological safety signals in hierarchical settings.

Table 1. Respondent Characteristics

Characteristic	Category	n	% / Average
Education	SMA/SMK equivalent	130	48.15
	S1 / Bachelor	138	51.11
Department (top 2)	PBS / Polymer Belt Services		22.59
	General Fabrication		26.3
Position (top 2)	Staff/Technician/Asst. Technician (Helper)		83.58
	Foreman / Supervisor		11.68
Age group (top 2)	24 28	86	31.85
	29 34	51	18.89
Work duration (average)	4 years 11 months		

The descriptive characteristics reported for the control variables indicate that the sample was divided across educational levels, with the largest proportions coming from SMA/SMK-equivalent education (48.15%; 130 respondents) and S1/Bachelor's degree (51.11%; 138 respondents). The departmental composition reflects the company's operational core. The Polymer Belt Services (PBS) group contributed 22.59% of the respondents, while General Fabrication contributed 26.30%, consistent with the company's dominant activities around conveyor and fabrication-related workstreams. In terms of job position, the dataset was heavily weighted toward operational roles: Staff/Technician/Assistant Technician (Helper) comprised 83.58% of the respondents, while Foreman/Supervisor represented 11.68%. The average tenure (work duration) across respondents was approximately 4 years and 11 months, suggesting that most participants had sufficient time in the organization to evaluate leadership style and team climate through repeated interactions and project cycles.

4.2. Validity and Reliability Outcomes

Before hypothesis testing, the study evaluated the measurement properties of the questionnaire to confirm that the items performed as expected. Validity was assessed using item total correlation, comparing each item's correlation coefficient (r count) against the critical r table value for 270 respondents, which was 0.119. Across all three constructs, every item exceeded the threshold, indicating that each statement contributed meaningfully to its corresponding construct. For participative leadership (X1), all 20 items were valid. The item-total correlation values ranged from 0.326 to 0.688, consistently exceeding the r table value of 0.119. This range indicates moderate to strong associations between each item and the overall participative leadership scale, suggesting that the instrument captures a coherent perception of participative behaviors, including involvement, openness, consultation, and autonomy support, as perceived by employees. For psychological safety (X2), all 20 items met the validity criterion. The item total correlation coefficients ranged from 0.200 to 0.517, again exceeding the r-table benchmark. Although several items clustered closer to the lower bound of the range, every item still showed an acceptable relationship with the total psychological safety score, indicating that the construct was measurable and sufficiently consistent for further analyses. For employee performance (Y), all 25 items were valid, with correlation coefficients ranging from 0.305 to 0.525. These coefficients reflect moderate to strong item contributions and support the conclusion that the performance instrument is aligned well with the underlying construct captured by the total performance score.

Reliability testing was conducted to assess internal consistency. For participative leadership (X1), the "Cronbach's alpha if item deleted" values ranged from 0.854 to 0.869. These values indicate very high internal consistency, and the narrow band suggests that no single item substantially weakened the scale. In other words, removing any individual item would not materially improve the reliability of the measure, which implies that the full 20-item set was stable and robust in capturing participative leadership perceptions among the 270 respondents. For psychological safety (X2), the "Cronbach's alpha if item deleted" values ranged from 0.701 to 0.728. These results indicate good internal consistency, surpassing the commonly accepted minimum thresholds, and suggesting that the psychological safety instrument produced reliable scores in this sample. Although the reliability levels were lower than those observed for the participative leadership scale, they were still comfortably within the range typically interpreted as acceptable to good reliability for organizational survey research. For employee performance (Y), the "Cronbach's alpha if item deleted" values ranged from 0.773 to 0.786. These values show a strong internal consistency across the 25-item performance instrument. Similar to the leadership scale, the range implies that item deletion would not meaningfully improve reliability, supporting the retention of all items for subsequent regression modeling analyses. The validity and reliability results indicate that the instruments were suitable for the regression analysis. All items met the validity criterion, and internal consistency levels were strong across constructs, supporting the conclusion that the measurement model was stable and appropriate for testing the hypothesized relationships.

4.3. Regression Assumptions and Diagnostic Tests

Prior to regression interpretation, several diagnostic tests were conducted to confirm that the data met the classical assumptions for linear regression. The normality of the residuals was tested using the One-Sample Kolmogorov–Smirnov procedure. The analysis produced an asymptotic. Sig. (2-tailed) value of 0.200, which exceeded the 0.05 threshold. This indicates that the residuals did not significantly deviate from normality, supporting the appropriateness of the regression-based inference. The Monte Carlo significance estimate was also reported as 0.655, with a 99% confidence interval bounded between 0.646 and 0.665, reinforcing the conclusion that the residual distribution was acceptable for modeling.

Multicollinearity diagnostics indicated no problematic overlap between participative leadership and psychological safety. Both predictors showed tolerance values of 0.781 and VIF values of 1.281. Because the tolerance exceeded 0.10, and the VIF remained well below 10, there was no evidence of a strong intercorrelation that would distort the coefficient estimates or inflate the standard errors. This suggests that participative leadership and psychological safety, while conceptually related, retained sufficient independence in this dataset to uniquely contribute to the prediction of employee performance.

Heteroscedasticity was assessed by evaluating the predictor significance in the heteroscedasticity test output. Participative leadership had a significance value of 0.096, and psychological safety had a significance value of 0.388. Both values exceeded 0.05, indicating that the residual variance did not systematically vary with changes in the predictors. This supports the assumption of homoscedasticity and suggests that the standard errors and hypothesis tests based on the regression model are unlikely to be biased by non-constant error variance.

Linearity tests were also performed to confirm that the relationships between each predictor and employee performance could be modeled as linear relationships. For the employee performance participative leadership relationship, the deviation from linearity significance value was 0.085, which is greater than 0.05, indicating no statistically significant deviation from linearity. For the employee performance psychological safety relationship, the deviation from linearity significance value was 0.188, which was also above 0.05, supporting a linear relationship. These results indicate that linear regression is an appropriate modeling approach for the relationships examined in this study.

4.4. Hypothesis Testing Results: Bivariate Regression Models

The first hypothesis was tested by estimating a simple linear regression model in which participative leadership (X1) predicts employee performance (Y). The model summary reported an R value of 0.334 and an R square value of 0.254, with an adjusted R square of 0.251. The standard error of the estimate was 7.21648. Substantively, the model suggests that participative leadership accounts for 25.4% of the observed variance in employee performance scores within this sample, while the remaining variance is attributable to other factors not included in the model.

The ANOVA results indicated that the model was statistically significant. The regression sum of squares was 4754.586 with df = 1, the residual sum of squares was 13956.781 with df = 268, and the resulting F-statistic was 91.298. The model significance level was reported as 0.000, which is below 0.05, supporting the conclusion that participative leadership is a meaningful predictor of employee performance.

The coefficient estimates reinforce this conclusion. The constant term was 62.183 (Std. Error = 3.794; t = 16.391; Sig. = 0.000). The unstandardized coefficient for participative leadership was B = 0.465 (Std. The error was 0.049), with a standardized beta of 0.504, a t-value of 9.555, and a significance value of 0.000. The positive coefficient indicates that a higher perception of participative leadership is associated with higher employee performance. The standardized coefficient suggests a moderate effect size in standardized units, consistent with the substantive interpretation that leadership involvement and openness are linked to better performance outcomes in this organizational setting. Based on these results, the first hypothesis was supported.

The second hypothesis was tested using a simple linear regression model, with psychological safety (X2) predicting employee performance (Y). The model summary reported an R value of 0.626 and an R square value of 0.392, with an adjusted R square of 0.390. The standard error of the estimate was

6.51516. These results indicate that psychological safety explains 39.2% of the variance in employee performance scores, representing a larger share of the explained variance than the participative leadership-only model.

The ANOVA table showed a regression sum of squares of 7335.494 (df = 1), a residual sum of squares of 11375.873 (df = 268), and an F-statistic of 172.814. The model significance value was 0.000, indicating that psychological safety is a significant predictor of employee performance.

The coefficient table reported a constant of 36.511 (Std. Error = 4.709; t = 7.754; Sig. = 0.000). The unstandardized coefficient for psychological safety was B = 0.779 (Std. Error = 0.059), with a standardized beta of 0.626, a t-value of 13.146, and a significance value of 0.000. A positive coefficient indicates that higher psychological safety perceptions are strongly associated with higher performance scores. In relative terms, the standardized coefficient for psychological safety in this bivariate model was larger than that for participative leadership in its corresponding model, suggesting that psychological safety may be a particularly salient predictor of performance in this setting. Based on these results, the second hypothesis is supported.

4.5. Hypothesis Testing Results: Multiple Regression Model

The third hypothesis tests whether participative leadership (X1) and psychological safety (X2) jointly predict employee performance (Y). A multiple linear regression model was estimated, including both predictors. The model summary reported R = 0.670 and R Square = 0.449, with an adjusted R Square of 0.445. The standard error of the estimate decreased to 6.21375, indicating improved predictive accuracy relative to that of the bivariate models. Substantively, the model suggests that 44.9% of the variance in employee performance can be explained by the combined effects of participative leadership and psychological safety, with 55.1% explained by other variables outside the model.

The ANOVA results confirmed that the overall model was statistically significant. The regression sum of squares was 8402.313, with df = 2; the residual sum of squares was 10309.053, with df = 267; and the F-statistic was 108.808. The significance value was 0.000, indicating that the predictor set, as a whole, explained a statistically meaningful amount of variance in employee performance.

The coefficient results indicated that both predictors were significant when included together. The constant was 29.669 (std. dev.= Error = 4.676; t = 6.346; Sig. = 0.000). Participative leadership had an unstandardized coefficient of B = 0.249 (Std. Error = 0.047), a standardized beta of 0.270, t = 5.256, and Sig. = 0.000. Psychological safety had an unstandardized coefficient of B = 0.621 (Std. Error = 0.064), a standardized beta of 0.500, t = 9.720, and Sig. = 0.000. Both coefficients were positive, indicating that higher scores on each predictor were associated with higher employee performance, even after accounting for the other predictors.

The relative magnitude of the standardized coefficients suggests that psychological safety contributed more strongly to performance than participative leadership in the combined model, although both remained meaningful. This pattern implies that while participative leadership is associated with performance outcomes, a substantial portion of performance variation is more directly aligned with whether employees feel safe to speak up, raise problems, and coordinate their work without fear of negative consequences. In practical organizational terms, the results imply that leadership practices and psychological climate operate together: participative behaviors may create opportunities for involvement and feedback, while psychological safety determines whether employees can consistently use those opportunities in their day-to-day work without interpersonal threats.

4.6. Multiple Regression Robustness Check with Control Variables

To evaluate whether the core relationships remained stable when accounting for respondents' background characteristics, a second multiple regression model was estimated, including control variables related to age group, education level, department type, and position category. In this model, the constant term was 30.224, with a significance level of 0.000. The coefficient for participative leadership remained positive and statistically significant, with B = 0.258 (Std. Error = 0.049), standardized beta =

0.280, t = 5.303, and Sig. = 0.000. Psychological safety also remained positive and statistically significant, with B = 0.617 (Std. Error = 0.065), standardized beta = 0.496, t = 9.536, and Sig. = 0.000.

Importantly, inclusion of controls did not significantly change the results. The coefficients for participative leadership and psychological safety were very close to those reported in the model without controls, indicating that the relationships were not explained by differences in demographic or job-related categories. The control variables themselves showed significance values above 0.05, indicating that within this model specification, age, education, department, and position grouping did not contribute statistically significant additional explanatory power to employee performance beyond the two focal predictors. The overall implication is that participative leadership and psychological safety are robust predictors of performance across employee subgroups, rather than being driven by a specific demographic segment.

Participative leadership and psychological safety were found to have consistent, positive, and statistically significant relationships with employee performance. The bivariate model linking participative leadership to performance explained 25.4% of the performance variance (R Square = 0.254), whereas the bivariate model linking psychological safety to performance explained 39.2% (R Square = 0.392). When both predictors were modeled simultaneously, the explained variance increased to 44.9% (R Square = 0.449), indicating that participative leadership and psychological safety provided complementary explanatory contributions. The joint model also showed that both predictors remained significant, with psychological safety showing a stronger standardized coefficient (β = 0.500) than participative leadership (β = 0.270), suggesting that psychological safety may be the more proximal performance-related climate factor in this organizational context. A summary of the hypothesis testing results is presented in Table 2.

Table 2. Summary of Hypothesis Testing

Hypothesis	Model	R	R^2	Adj. R^2	F	Key coefficients (B, Beta, t, p)
H1	Participative leadership → Employee performance	0.504	0.254	0.251	91.298	Const = 62.183 (t=16.391, p=0.000); PL: B=0.465, Beta=0.504, t=9.555, p=0.000
H2	Psychological safety → Employee performance	0.626	0.392	0.39	172.814	Const = 36.511 (t=7.754, p=0.000); PS: B=0.779, Beta=0.626, t=13.146, p=0.000
H3	Participative leadership + Psychological safety → Employee performance	0.67	0.449	0.445	108.808	Const=29.669 (t=6.346, p=0.000); PL: B=0.249, Beta=0.270, t=5.256, p=0.000; PS: B=0.621, Beta=0.500, t=9.720, p=0.000

The diagnostic tests supported the suitability of the regression analysis. The residuals were normally distributed, as indicated by the Kolmogorov–Smirnov significance value of 0.200. Multicollinearity was not present, with VIF and tolerance values of 1.281 and 0.781, respectively. Heteroscedasticity was not indicated, with predictor significance values exceeding 0.05. Linearity was supported by deviation-from-linearity significance values above 0.05 for both predictor outcome relationships. These results collectively support the statistical adequacy of the regression models and strengthen confidence in the interpretation of the coefficients and significance tests. The statistical pattern provides a clear basis for operational recommendations because the performance outcomes at PT. Suprabakti Mandiri appear systematically linked to both leadership behaviors and team psychological climate. The combined regression results indicate that performance variation is not only attributable to technical competence and procedural compliance. Instead, it aligns with how leaders involve employees and how safe employees feel when reporting issues and coordinating across functions. This interpretation is reinforced by the fact that psychological safety explained a larger share of performance variance than participative leadership in the bivariate model and remained a stronger predictor even when both variables were included together. In applied terms, this pattern suggests that improving performance consistency requires attention to both participative leadership practices and psychological safety conditions rather than relying solely on technical standardization or stricter enforcement.

In the organizational context described, recurring Non-Conformance Reports (NCRs) and uneven departmental outcomes were treated as business symptoms linked to performance variation. The

regression findings support the argument that leadership style and psychological climate are relevant levers for performance improvement, particularly for work requiring cross-departmental coordination, early error detection, and timely communication. Because psychological safety reflects employees' willingness to surface concerns without fear, it is consistent with the operational requirement to detect non-conformities early, rather than after fabrication or inspection stages have progressed further. Similarly, participative leadership reflects whether leaders actively engage workers in problem-solving and decision-making processes, which is highly relevant in multistage production and maintenance workflows, where mistakes often arise from coordination breakdowns rather than isolated technical failures.

In line with this evidence, the proposed operational response emphasizes leadership-engaged process redesign and capability development rather than purely technical fixes. The recommended direction is to refine standard operating procedures so that leadership involvement becomes consistently participative throughout the production flow and inspection stages, thereby creating more structured opportunities for cross-functional checking and shared accountability. Simultaneously, the proposed leadership development initiative aimed to embed psychological safety principles into day-to-day supervisory behavior, strengthen non-punitive responses to error reporting, increase employee voice during routine meetings, and improve feedback quality during inspections and performance dialogues. The implementation approach was described as gradual and staged to minimize operational disruption, beginning with leadership alignment and the communication of expectations, followed by participative leadership training, integration into inspection and coordination routines, and finally, monitoring and standardization so that the behaviors become part of the system rather than a temporary program.

Despite the statistical robustness of the regression models, several limitations must be acknowledged when interpreting the findings. First, it used a cross-sectional design, which captures the relationships among participative leadership, psychological safety, and employee performance at a single point in time. Consequently, the analysis supports an associative interpretation but does not permit strong causal claims about the direction of influence over time. Leadership behavior and psychological safety may shape performance; however, it is also possible that stronger-performing teams perceive leadership and team climate more positively.

Second, employee performance was measured through self-reported responses, which may have introduced perceptual bias and common method variance. Although self-report data are useful for capturing employees' lived experiences of leadership and psychological safety, they may not fully reflect objective performance outcomes, such as productivity rates, error frequency, rework levels, inspection results, or supervisor-rated performance. Third, this study focuses on a single company operating in a specific contractor-based engineering and industrial service context. While this strengthens contextual relevance, it also limits the generalizability of the findings to other firms, sectors, and organizational cultures with different leadership systems, client pressures, and operational structures.

These limitations suggest several avenues for future research. Longitudinal designs are valuable for examining whether changes in participative leadership and psychological safety are followed by measurable changes in employee performance. Comparative studies across multiple companies or contractor-based industrial firms would also help determine whether the observed relationships remain stable across organizational settings. Future research could test more complex models, particularly mediation or indirect effect models, to examine whether psychological safety functions as an explanatory pathway through which participative leadership influences employee performance. Such extensions would strengthen the theoretical contribution of the model and provide a more nuanced understanding of how leadership and team climate interact in high-risk operational environments.

5. CONCLUSION

This study examined the relationship between participative leadership, psychological safety, and employee performance at PT Suprabakti Mandiri, with the practical goal of informing solutions to recurring Non-Conformance Reports (NCRs). The findings show that participative leadership is

positively and statistically associated with employee performance, indicating that when leaders involve employees, encourage two-way communication, and share responsibility for decisions, employees perform better. Psychological safety also demonstrates a positive and statistically significant relationship with performance, suggesting that employees deliver stronger outcomes when they feel able to speak up, ask questions, admit mistakes, and propose improvements without fear of negative consequences. When both variables are analyzed together, participative leadership and psychological safety jointly explain a meaningful proportion of performance variation, reinforcing the view that leadership behavior and team climate are complementary drivers rather than separate influences. The results imply that the core organizational issue is not primarily employee capability but the misalignment between leadership practices, system execution, and the psychological conditions needed for consistent performance in a quality- and safety-sensitive environment. In this context, performance and NCR reduction depend on whether leaders can translate operational expectations into a daily work climate that supports early reporting, cross-functional coordination, and continuous improvement.

Ethical Approval

Not Applicable

Informed Consent Statement

Not Applicable

Confidentiality Statement

Not applicable. The study did not collect personal or sensitive data. All legal materials and documents used are publicly accessible and were utilized solely for academic and research purposes.

Authors' Contributions

FRMHM contributed to conceptualization, methodology, data collection, formal analysis, investigation, visualization, and writing the original draft of the manuscript. AFH contributed to research supervision, conceptual refinement, methodology review, validation of the analysis, and critical review and editing of the manuscript. Both authors read and approved the final version of the manuscript.

Disclosure Statement

The author declares no conflict of interest related to this research.

Data Availability Statement

The data presented in this study are available on request from the corresponding author due to privacy reasons.

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