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Influence of OSH Awareness, Training, Equipment, and Supervision on Construction Safety in Jakarta: A Quantitative Study

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***Abstract*—** The construction industry remains a major contributor to Indonesia's economic growth, accounting for approximately 10% of the national GDP in 2022. However, despite substantial infrastructure investment and post-pandemic recovery, workplace accidents remain prevalent, rendering construction one of the riskiest sectors in the country. This study examines the influence of four dimensions of Occupational Safety and Health (OSH)—awareness, training, equipment, and supervision—on workplace safety within large construction firms in Jakarta. A quantitative approach was employed, involving structured questionnaires distributed to 81 managerial-level respondents. Statistical analysis using SPSS revealed that while all four OSH dimensions collectively influence workplace safety, only equipment demonstrated a statistically significant individual effect. These findings highlight the critical importance of integrating high-quality equipment within broader OSH strategies. Practical implications suggest that interventions focusing solely on awareness or training are insufficient unless complemented by robust provision and maintenance of protective equipment.

***Keywords*—** construction industry, Occupational Safety and Health, OSH management, workplace safety.

I. INTRODUCTION

In addition to international findings, local research by Wacono et al. (2022) indicates that although many large Indonesian construction companies formally implement OSH standards, practical challenges persist—particularly in communication, supervision, and training effectiveness.

While various studies have discussed the general importance of OSH in construction, few have quantitatively assessed the relative influence of awareness, training, equipment, and supervision in a developing country context—particularly in the capital city Jakarta, where mega projects dominate.

Wuala and Rarasati (2020) highlighted that inadequate safety practices and unprepared equipment are significant contributors to project delays in Southeast Asia. Ismail et al. (2012) similarly found that in Indonesia, poor enforcement and inadequate maintenance of safety equipment frequently result in occupational hazards.

The construction industry serves as a vital pillar of Indonesia's national development, contributing significantly to employment creation and infrastructure growth. In 2022, this sector contributed around 10% of the national GDP. However, this rapid expansion is associated with persistently high rates of workplace accidents, making construction one of the most hazardous industries in the country. Data from the national social security agency, BPJS Ketenagakerjaan, underscores the urgent need for a more structured and effective Occupational Safety and Health (OSH) framework to mitigate risks in this sector.

According to BPJS Ketenagakerjaan, the number of reported workplace accidents in Indonesia has shown a concerning upward trend over the past four years. While the active workforce covered by the social security scheme increased modestly, occupational accidents grew from 182,835 cases in 2019 to 297,725 cases in 2022, representing a 27% year-on-year increase between 2021 and 2022 alone. The proportion of accidents relative to active participants also rose steadily from 0.54% in 2019 to 0.83% in 2022 (Table 1).

Table 1. *Reported Workplace Accidents in Indonesia (BPJS 2019–2022)*

Description	2019	2020	2021	2022
Active participant (x 1.000)	34,166	29,980	30,659	35,864
Workplace accidents	182,835	227,740	234,370	297,725

Accidents / participants	0.54%	0.74%	0.76%	0.83%
Accident growth rate		21.3%	5.7%	27.0%

Source: BPJS Ketenagakerjaan, Integrated Annual Reports, (2020, 2021, 2022, 2023)

These four variables were selected based on their frequent appearance in global OSH frameworks such as ILO-OSH 2001, OSHA recommendations, and supporting studies by Fernández-Muñiz et al. (2007), which outline them as core elements of effective safety systems.

This trend highlights the vulnerability of high-risk industries such as construction, where inadequate safety practices and insufficient equipment readiness remain critical challenges. Previous studies have identified key elements affecting safety in high-risk work environments. Although awareness, training, and managerial oversight are commonly discussed, few investigations have assessed their combined and individual influence—particularly in the context of Indonesia's urban construction sector. This study aims to bridge that gap by analysing how awareness, training, equipment, and supervision influence workplace safety outcomes.

Furthermore, Adi and Kushartomo (2023) found that OSH implementation in Jakarta construction projects often faces limitations due to insufficient training budgets, limited use of PPE, and lack of awareness among site workers.

II. LITERATURE REVIEW

Kadir et al. (2022) conducted a comprehensive study on the safety climate across Indonesian construction firms and identified recurring weaknesses in safety resource allocation, enforcement, and communication—despite formal safety policies being in place. Their findings affirm the need for quantitative examination of OSH variables particularly in the Jakarta context.

Santoso et al. (2020) emphasized that implementing digital reporting systems such as HAZOB can significantly enhance workplace safety performance through proactive hazard identification and better coordination among stakeholders. This supports the notion that increased awareness and structured supervision play a crucial role in reducing construction-related accidents.

Ismail et al. (2012) established that the success of safety management systems in Southeast Asia depends on factors such as strong managerial commitment, proactive worker participation, and systematic training audits. This study is anchored in several theoretical frameworks that underpin OSH. The Behaviour-Based Safety (BBS) model emphasises promoting safe behaviour through observation and positive reinforcement. Reason's Swiss Cheese Model (1990) conceptualises accidents as the result of multiple systemic failures aligning—from equipment flaws to training deficiencies. Additionally, OSH Management System frameworks (Pillay, 2014) promote structured interventions, including hazard identification, equipment allocation, and sustained supervision.

In this study, OSH is conceptualised through five key variables: awareness, training, equipment, supervision, and workplace health and safety. Each variable is operationalised through measurable parameters forming the basis of the research instrument:

- Awareness includes management support, rule enforcement, employee involvement, and regular safety communication.
- Training focuses on job-specific instruction, risk identification, and practical learning.
- Equipment refers to the provision, use, and maintenance of personal protective equipment (PPE) and collective protective equipment (CPE).
- Supervision covers worker compliance, competence evaluation, and continuous safety monitoring.
- Workplace health and safety encompasses cleanliness, ergonomic task allocation, infrastructure safety, and employee well-being.

Managers were selected because they oversee OSH implementation, procurement of safety equipment, and supervision of workers. Their perspectives reflect how policies and systems are enforced within their respective companies.

These constructs are grounded in the standards set by the International Labour Organization (ILO, 2001) and the Occupational Safety and Health Administration (OSHA, 2022), as well as scholarly contributions by Fernández-Muñiz et al. (2007) and Vinodkumar and Bhasi (2010).

III. METHODOLOGY

This research adopted a quantitative approach to examine the influence of OSH factors on workplace safety within Jakarta's construction sector. The research population comprised managerial-level personnel employed in large construction firms, including nationally owned private contractors, foreign private firms, and state-owned enterprises (BUMN). These firms handle diverse project types such as high-rise buildings, industrial facilities, infrastructure developments, and large-scale joint ventures across Indonesia, either independently or collaboratively.

A cross-sectional survey design was employed to collect primary data through structured questionnaires. The sample consisted of 81 respondents, which exceeds the recommended minimum for regression analysis involving four independent variables. The questionnaire contained 39 items, distributed as follows: 10 for awareness, 7 for training, 7 for equipment, 8 for supervision, and 7 for workplace safety and health. All items were measured using a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree).

Data collection was conducted in both printed and digital formats. Ethical considerations were addressed by ensuring informed consent, voluntary participation, and confidentiality. Data were analysed using SPSS version 24, with descriptive statistics, validity and reliability tests, classical assumption tests (normality, multicollinearity, heteroscedasticity), and multiple linear regression to determine collective and partial effects.

IV. RESULTS AND DISCUSSION

The demographic analysis showed that the majority of respondents were male (79%) and aged between 30 and 39 years (37%). Most held a Bachelor's degree (59.3%) and were engaged in project management roles (51.9%). Work experience was well distributed, with most having less than 10 years (33.3%) or more than 20 years (32.1%) of experience (Table 2).

Table 2. *Respondent demographic*

Variable	Category	Freq.	%
Gender	Male	64	79.0%
	Female	17	21.0%
Age	<30 years	16	19.8%
	30 - <40 years	30	37.0%
	40 - <50 years	17	21.0%
	>50 years	18	22.2%
Education level	≤ High school	3	3.7%
	Diploma	10	12.3%
	Bachelor's degree	48	59.3%
	Doctoral degree	20	24.7%
Job position	Office management	35	43.2%
	Project management	42	51.9%
	Others	4	4.9%
Years of experience	<10 years	27	33.3%
	10 - <15 years	18	22.2%
	15 - <20 years	10	12.3%
	>20 years	26	32.1%

Source: Survey results (2025)

Of the 81 respondents, 35 worked in office management positions, 42 were engaged in project management roles, while 4 held other managerial functions. Regarding company certifications, 74 respondents reported ISO 9001 Quality Management Systems (QMS), 41 reported ISO 14001 Environmental Management Systems (EMS), and 52 reported ISO 45001 Occupational Health and Safety Management Systems (OHSMS). Meanwhile, 7 respondents were unaware of the certifications held by their companies.

Descriptive statistics revealed consistently high mean scores across all variables: awareness (46.37), training (31.75), equipment (32.68), supervision (36.69), and workplace safety and health (31.54) (Table 3).

Table 3. Descriptive Statistics

Variable	Mean	Std. Deviation
OSH Awareness	46.37	3.679
OSH Training	31.75	3.215
Equipment	32.68	2.797
Supervision	36.69	3.300
Workplace safety & health	31.54	3.025

Source: Survey results (2025)

Validity tests using Pearson's correlation showed r-values exceeding the critical value (0.219), confirming all items were valid. Reliability analysis showed Cronbach's Alpha values > 0.60 for all variables, indicating strong internal consistency (Table 4).

Table 4. Reliability test

Variable	Cronbach's Alpha
OSH Awareness	0.895
OSH Training	0.944
Equipment	0.902
Supervision	0.907
Workplace safety & health	0.931

Source: Survey results (2025)

Normality tests (Kolmogorov–Smirnov p = 0.068) confirmed data normality. Multicollinearity tests showed tolerance values > 0.1 and VIF < 10. (Table 5).

Table 5. Multicollinearity test

Variable	Tolerance	VIF
OSH Awareness	0.283	3.538
OSH Training	0.275	3.636
Equipment	0.227	4.408
Supervision	0.227	4.413

Source: Survey results (2025)

Multiple regression analysis revealed a strong relationship between independent and dependent variables (R = 0.750; Adjusted R^2 = 0.539; F = 24.367, p < 0.001). However, t-test results indicated that only equipment had a statistically significant partial effect (t = 2.610, p = 0.011). Awareness, training, and supervision were not individually significant (p > 0.05) (Table 6).

Table 6. t - Test Results (Partial Effect)

Variable	t-value	Sig. value
OSH Awareness	0.795	0.429
OSH Training	1.118	0.267
Equipment	2.610	0.011
Supervision	0.793	0.430

Source: Survey results (2025)

Practitioners and policymakers must go beyond training programmes and awareness campaigns; they should invest consistently in the provision, maintenance, and enforcement of equipment use—especially in high-risk projects such as bridges, tunnels, or skyscrapers.

The diverse job positions of respondents ensure representation of both strategic and operational perspectives. Furthermore, the fact that most respondents came from companies with international certifications (ISO 9001, ISO 14001, and ISO 45001) reflects a relatively mature safety management culture. Nevertheless, the finding that only equipment showed a significant individual effect suggests that certification and managerial awareness alone are insufficient without effective translation into tangible on-site safety practices.

V. CONCLUSION

This research employed a quantitative method to assess the influence of OSH awareness, training, equipment, and supervision on workplace safety in Jakarta's construction sector. While all four factors collectively contributed significantly to workplace safety, only equipment demonstrated a notable individual effect. The regression model confirmed a robust correlation ($R = 0.750$) and strong explanatory power (Adjusted $R^2 = 0.539$).

Practical implications suggest that construction firms should prioritise the readiness and maintenance of safety equipment as a foundational element of OSH strategies. For example, regular calibration and inspection of PPE (helmets, harnesses, scaffolding) should be mandatory, supported by documented maintenance schedules. Firms can also invest in advanced safety technologies such as fall-detection sensors and real-time site monitoring systems. Clear equipment maintenance policies (e.g., 'no use without valid inspection stamp') should be enforced to ensure accountability and compliance.

This study was limited to managerial-level perspectives and did not directly capture the views of operational-level workers. Therefore, the findings may not fully reflect the practical challenges at the execution level.

Future research should adopt a multi-level approach, incorporating both managerial and frontline insights, and consider longitudinal designs to better understand safety culture evolution.

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REFERENCES

[1] A, Kadir, F. Lestari, R.Y. Sunindijo, D. Erwandi, Y. Kusminanti, R. Modjo, B. Widanarko, and N.A. Ramadhan, "Safety Climate in the Indonesian Construction Industry: Strengths, Weaknesses, and Influential Demographic Characteristics", Buildings, vol. 12, pp. 639, May 2022.

[2] B. Fernández-Muñiz, J.M. Montes-Peón, and C.J. Vázquez-Ordás, "Safety culture: Analysis of the causal relationships between its key dimensions", Journal of Safety Research, vol. 38, no. 6, pp. 627–641, November 2007.

[3] BPJS Ketenagakerjaan, "Aggressive Growth for Sustainable Protection: 2019 Integrated Annual Report", April 2020.

[4] BPJS Ketenagakerjaan, "Adapting to Challenges, Strengthening Sustainable Innovations: 2020 Integrated Annual Report", April 2021

[5] BPJS Ketenagakerjaan, "Digital Transformation for Enhancing Service Excellence: 2021 Integrated Annual Report", April 2022

[6] BPJS Ketenagakerjaan, "Adaptive and Innovative for Impressive Growth: 2022 Integrated Annual Report", April 2023

[7] H.D. Wuala, and A.D. Rarasati, A. D, "Causes of delays in construction projects for developing Southeast Asian countries", IOP Conference Series: Materials Science and Engineering, 830(2), 022054. 2020.

[8] H. Wacono, R.P. Dewi, A.D. Kusuma, Ihsan, and H.H. Purba, "Kajian Literatur Sistematik Pada Risiko Keselamatan Dan Kesehatan Kerja Dalam Proyek Konstruksi Bangunan", Jurnal Teknik Sipil Indonesia, vol. 6, no. 1, pp 12-27, 2022.

[9] International Labour Organization (ILO), "Guidelines on Occupational Safety and Health Management Systems ILO-OSH 2001", 2nd ed., 2009.

[10] J. Reason, "Human Error", Cambridge University Press, 1990

[11] M.N. Vinodkumar, and M. Bhasi, "Safety management practices and safety behaviour:

Assessing the mediating role of safety knowledge and motivation", Accident Analysis & Prevention, no. 42, pp. 2082–2093. 2010.

[12] M. Pillay, "Health and Safety Management Systems: An Analysis of System Types and Effectiveness", CRC Press, 2014.

[13] Occupational Safety and Health Administration (OSHA), "Recommended Practices for Safety and Health Programmes in Construction", Oct' 2016.

[14] S. Santoso, Rochman, F. Sinaga, Pawenary, & P. Fithri, "Transformasi Digitalisasi Pelaporan HAZOB Untuk Meningkatkan Kinerja Keselamatan Kerja di Perusahaan". Jurnal Sains, Teknologi dan Industri, vol. 18, no. 1, pp. 112–119, December 2020.

[15] Y.K. Adi & W. Kushartomo, "Analisis Penerapan Keselamatan dan Kesehatan Kerja (K3) Pada Proyek X Di Jakarta Pusat". Jurnal Mitra Teknik Sipil, vol. 6 no. 3, pp. 589-594, August 2023.

[16] Z. Ismail, S. Doostdar, and Z. Harun, "Factors influencing the implementation of a safety management system for construction sites", Safety Science, no. 50, pp. 418-423, 2012.