Jurnal Kesehatan
Volume 17, Number 1, April 2026
ISSN 2086-7751 (*Print*), ISSN 2548-5695 (*Online*)
http://ejurnal.poltekkes-tjk.ac.id/index.php/JK

The Effect of Implementing the Digital Hazard Reporting Website Laporkan.id on the Safety Climate at PT X Surakarta

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ARTICLE INFO

Article history

Submitted:
6 August 2025

Revised:
5 November 2025

Accepted:
3 February 2026

Keywords:

Construction;
Digital reporting;
Safety climate.

ABSTRACT

Manual reporting in construction projects is often underutilized due to time constraints, complex procedures, and lack of feedback from management, resulting in many potential hazards going unreported, increasing the risk of workplace accidents and weakening the overall safety climate. Therefore, implementing a digital reporting platform such as Laporkan.id is expected to make the reporting process easier, faster, and more responsive, thereby encouraging workers to be more actively involved in safety practices and contributing to a stronger safety climate in the organization. This research aims to analyze the impact of implementing the Laporkan.id website on the safety climate at PT X Surakarta. This study employed a quasi-experimental, non-equivalent control-group design, with population was 95 field workers at PT X Surakarta. A sample of 78 workers was selected using proportional stratified random sampling. The data were collected using the Nordic Safety Climate Questionnaire (NOSACQ-50) and analyzed using the Wilcoxon Signed-Rank Test, the Mann-Whitney U Test, and Spearman's Rank Correlation. The Wilcoxon test indicated a significant increase in safety climate scores in the experimental group (p=<0.001). In contrast, the Wilcoxon test for the control group showed no significant change (p=0.285). The Mann-Whitney test revealed a significant difference between the two groups (p=<0.001). Furthermore, Spearman's correlation showed no significant relationship between safety climate and demographic variables, including age, education, length of service, or job section. The researcher advises PT X Surakarta to further implement the Laporkan.id website, a digital platform for hazard reporting, as part of the company's Occupational Health and Safety (OHS) program.

INTRODUCTION

Work activities in the construction sector often involve heavy physical labor, the use of heavy equipment, and working at heights, all of which carry significant physical and environmental risks (Sari, 2024). According to data from the International Labor Organization (ILO) (Wadsworth & Walters, 2019), it is estimated that there are 395 million non-fatal workplace accidents annually, along with nearly 3 million fatalities each year caused by workplace accidents.

In Indonesia, according to data from Badan Penyelenggara Jaminan Sosial (BPJS Ketenagakerjaan) in 2024, 462, 241 workplace accidents were recorded. From the total number of workplace accidents in Indonesia in 2024, the construction sector accounts for 0.92% or 4,252 cases (Kementerian Ketenagakerjaan Republik Indonesia, 2025).

In construction work, most accidents are caused by failures to identify and control potential hazards in the workplace (Karima & Koesyanto, 2021). Many workers have limited awareness of occupational risks and are reluctant to report unsafe acts or conditions, especially when reporting systems are manual, impractical, or not integrated (Hansen, 2022).

A similar condition was observed at PT X Surakarta, the main contractor for a seven-floor educational building project currently in the upper structure phase, involving rebar, formwork, and architectural work. Based on an interview with PT X Surakarta's HSE, Hazard Identification and Risk Assessment (HIRA), and a preliminary survey in June 2025, 60% of workers still had limited hazard awareness and rarely reported unsafe conditions. The field observations revealed that many workers did not use personal protective equipment (PPE) and engaged in unsafe actions. These findings indicate that hazard identification has not been fully integrated into workers' daily safety behavior.

Low worker participation in hazard reporting is a significant challenge in creating a safe work environment. When workers are reluctant or unmotivated to report unsafe conditions, the risk identification process is hindered, and potential accidents are difficult to prevent proactively (Ali et al., 2024). An ineffective or poorly implemented reporting system can also discourage workers from taking part in safety initiatives, reducing the overall flow of safety-related information on-site.

The absence of an effective reporting system can create the perception that management does not take workplace safety seriously. When employees feel that management does not prioritize or respond to reported safety concerns, trust and communication between both parties deteriorate. This condition negatively influences the safety climate, which represents workers' shared perception of the organization's values, attention, and priorities regarding safety (Syed-Yahya et al., 2022).

The implementation of digital reporting is closely related to several dimensions of safety climate, such as management commitment, safety communication, and worker involvement (NOSACQ-50). A transparent and responsive reporting system can build trust in management and enhance workplace safety climate (Sari et al., 2024). Previous studies have examined how digital hazard-reporting mechanisms significantly improve workers' perceptions of occupational safety and health (OSH) (Salsabila & Wahyuningsih, 2023). Other studies have shown that the implementation of structured digital HAZOB (Hazard Observation) reporting in the workplace can significantly increase worker participation in the hazard identification process (Santoso et al., 2020). As a result, a more risk-aware work culture is formed as workers become more accustomed to observing and reporting hazardous conditions. Research by Sikumbang et al. (2022) shows that the most important factors for strengthening the safety climate are procedures, worker awareness of the importance of occupational health and safety, and communication between management and workers.

So far, no research has specifically examined how increased hazard reporting, particularly through digital innovations, can affect the safety climate in Indonesia's construction sector (Maryati et al., 2025). Therefore, researchers developed a digital hazard reporting platform called "Laporkan.id," which enables workers to report unsafe actions and conditions in real time, quickly, and transparently. Based on this background, this study aims to analyze the impact of implementing the Laporkan.id digital hazard reporting website on the safety climate at PT X Surakarta, to evaluate the role of digital technology in strengthening a sustainable OSH culture in the construction sector.

METHOD

This type of research is quasi-experimental, with a non-equivalent control group design, used to evaluate the effect of an intervention without random assignment of participants. It compares outcomes between groups or across time to determine the intervention's impact while controlling for potential biases. The differences between the experimental and control groups were measured using a pre-test administered before the intervention and a post-test administered after the intervention. The research was conducted at PT. X Surakarta from March to August 2025.

Proportional stratified random sampling was used to determine a sample that represented the population of construction workers at PT X Surakarta. The sample size was determined using the Slovin formula, resulting in a total of 78 respondents, who were divided proportionally into two groups: experimental (n=39) and control (n=39). The division of the sample in each group considered the proportion of the three types of work sections, reinforcement, formwork, and architecture, to ensure the representation of each work stratum.

Safety climate was measured using the Nordic Occupational Safety Climate Questionnaire (NOSACQ-50), comprising 50 items across seven dimensions. The scoring categories in this study were divided into four: >3.30 was categorized as "Good," scores between 3.00 and 3.30 as "Fairly Good," scores between 2.70 and 2.99 as "Fairly Poor," and scores <2.70 as "Poor."

The validity and reliability of this questionnaire were tested on 35 construction workers in Surakarta City. The validity test results showed that all 50 items had a calculated r value > 0.34, thus indicating validity. Meanwhile, the reliability test results using Cronbach's Alpha showed a p-value of 0.976, indicating that the instrument is highly reliable.

A socialization session was conducted with the experimental group regarding the Laporkan.id website, sharing the link (https://sites.google.com/view/laporkanid/beranda) and providing training on the procedures for reporting hazards through the website. The implementation of Laporkan.id was then monitored over two weeks. During the intervention phase, all participants in the experimental group were required to submit at least one hazard report via the Laporkan.id website. This requirement was established to ensure that all respondents had direct exposure to the reporting system used as the intervention instrument. This strategy aligns with the principles of behavior-based digital interventions, where active user participation significantly influences program effectiveness (Zulkarnain, 2024).

After data collection, data analysis was performed using a statistical application. Univariate analysis was conducted on safety climate scores and the controlled confounding variables (age, education level, length of service, and job type/section). Bivariate analysis was then performed to examine the influence and relationships between variables and respondent characteristics. Meanwhile, the uncontrolled confounding variables in this study consisted of job risk level, workers' psychological condition, and individual motivation. This study was conducted after obtaining ethical approval from the Health Research Ethics Committee of Dr. Moewardi General Hospital with number 1.637/VII/HREC/2025.

RESULTS

Table 1. Characteristics of respondents

Variable		f	%
Age	<26 years	7	9.0
	26-35 years	29	37.2
	36-45 years	27	34.6
	46-55 years	15	19.2
Education Level	Elementary School	33	42.3
	Junior High School	35	44.9
	Senior High School	10	12.8
Work Experience	<5 years	55	70.5
	>5 years	23	29.5
Job Roles	Steelwork	27	34.6
	Formwork	27	34.6
	Architecture	24	30.8

Table 1 presents the results of the analysis of the research respondents' characteristics. It was found that most respondents were in the 26–35 age range, namely 29 respondents (37.2%). In terms of educational level, the majority of respondents were junior high school graduates, namely 35 people (44.9%). In terms of work experience, the majority of respondents had less than

5 years of work experience, totaling 55 respondents (70.5%). Regarding job roles, respondents were divided into three fields: steelwork (27 respondents, 34.6%), formwork (27 respondents, 34.6%), and architecture (24 respondents, 30.8%). This distribution was nearly equal between the experimental and control groups.

Table 2. Safety climate score of the experimental group

	Experimental group				
	Mean	**Min**	**Max**	**SD**	**n**
Pre-test	2.038	1.32	2.88	0.530	39
Post-test	3.234	3.02	3.68	0.215	39

Based on Table 2, the pre-test average safety climate score in the experimental group that received the intervention was 2,038; the minimum was 1,32; the maximum was 2,88; and the standard deviation was 0,530. After the intervention was implemented, there was a change in the safety climate scores of the experimental group, with the average score increasing to 3,234; the minimum score increasing to 3,02; the maximum score increasing to 3.68; and the standard deviation decreasing to 0,215.

Table 3. Safety climate score of the control group

	Control group				
	Mean	**Min**	**Max**	**SD**	**n**
Pre-test	1.99	1.58	2.90	0.491	39
Post-test	1.92	1.44	2.88	0.507	39

Table 3 shows the safety climate scores for the control group that did not receive intervention. The scores at pre-test and post-test showed changes, but were not significant. At pre-test, the average safety climate score was 1,99; the minimum value was 1,58; the maximum value was 2,90; and the standard deviation was 0,491. Furthermore, the post-test safety climate scores for the control group decreased to an average of 1,92; the minimum value decreased to 1,44; the maximum value decreased to 2,88; and the standard deviation increased to 0,507.

Table 4. Shapiro-Wilk normality test

Data	**Shapiro-Wilk**			
	Control		**Experimental**	
	n	**p**	**n**	**p**
Pre-test	39	0.000	39	0.001
Post-test	39	0.000	39	0.000

Based on Table 4, the Shapiro-Wilk normality test indicates a p-value < 0.05, indicating that the data are not normally distributed.

Table 5. Kolmogorov-Smirnov monte carlo normality test

Data	**Kolmogorov-Smirnov Monte Carlo**			
	Control		**Experimental**	
	n	**p**	**n**	**p**
Pre-test	39	0.003	39	0.425
Post-test	39	0.097	39	0.659

The normality test using the Kolmogorov-Smirnov Monte Carlo in Table 5 shows that, in the control group, some data remain non-normally distributed, with a p-value < 0.05. Meanwhile, in the experimental group, all data are normally distributed, with a p-value> 0.05. The bivariate analysis technique used in this study is a nonparametric test.

Table 6. Correlation between Respondent Characteristics and Safety Climate

Respondent characteristics	Spearman's rank correlation p-value	
	Control	Experimental
Age	0.426	0.744
Education Level	0.134	0.943
Work Experience	0.449	0.064
Job Roles	0.770	0.241

Table 6 shows that, for the control group that did not receive intervention, the significance values for age, education level, length of service, and job type were 0.426, 0.134, 0.449, and 0.770, respectively. These figures indicate that all characteristics had p-values>0.05, suggesting no significant relationship between respondent characteristics and safety climate in the control group.

Similarly, in the experimental group, despite receiving the intervention, the test results show no significant relationships between respondent characteristics and safety climate, with significance levels of 0.744 for age, 0.943 for education level, 0.064 for years of service, and 0.241 for job department. The significance levels for all respondent characteristics in the experimental group indicate p>0.05.

Table 7. The impact of the Laporkan.id website on safety climate of experimental group

Wilcoxon signed rank test of experimental group							
Safety Climate	Pre-test		Post-test		difference (Δ) f	*p-value*	N
	f	%	f	%			
Good	0	0	12	30.8	+12	< 0.001	39
Fairly Good	0	0	27	69.2	+27		
Fairly Poor	9	23.1	0	0	-9		
Poor	30	76.9	0	0	-30		

The statistical test results in Table 7 show that the p-value of the Wilcoxon signed-rank test in the experimental group is < 0.001. P < 0.05 indicates a statistically significant difference between the safety climate scores before and after the intervention of implementing the Laporkan.id website in the experimental group.

Table 8. The impact of the Laporkan.id website on safety climate of control group

Wilcoxon Signed Rank Test of Control Group							
Safety Climate	Pre-test		Post-test		difference (Δ) f	p-value	n
	f	%	f	%			
Good	0	0	0	0	-	0,285	39
Fairly good	0	0	0	0	-		
Fairly poor	11	28.2	10	25.6	-1		
Poor	28	71.8	29	74.4	+1		

Based on the statistical test results in Table 8, the Wilcoxon Signed Rank Test in the control group yielded a p-value of 0.285. This indicates that there was no significant difference in safety climate scores between the pre-test and post-test in the control group.

Table 9. Safety climate between the experimental and control groups after intervention

Mann-Whitney U Test						
Safety Climate	Control		Experiment		p-value	N
	f	%	f	%		
Good	0	0	12	30.8	<0.001	39
Fairly Good	0	0	27	69.2		
Fairly Poor	10	25.6	0	0		
Poor	29	74.4	0	0		

The statistical test results in Table 9 show that the p-value for the Mann-Whitney U test is <0.001 (p<0.05), indicating a significant difference in post-test safety climate scores between the control and experimental groups.

DISCUSSION

Correlation between respondent characteristics and safety climate

The results of the Spearman's rank correlation test in Table 6 indicate that there is no significant relationship between respondents' age and safety climate scores in both groups. In other words, differences in respondents' ages are not significantly correlated with their perceptions of workplace safety culture, both before and after the Laporkan.id digital reporting intervention. These findings imply that perceptions of safety are shaped primarily by organizational factors and the consistency of safety management systems, rather than by individual characteristics such as age (Silvia et al., 2020). However, this finding contradicts Puspitasari et al.'s (2023) findings, which showed that younger workers tend to have lower perceptions and more cautious decision-making than older workers, particularly in high-risk environments.

Similarly, the analysis revealed no significant relationship between educational level and safety climate in both groups (p>0.05). This indicates that workers' formal educational backgrounds do not solely shape safety climate in an organization but are more influenced by structural and cultural factors within the workplace (Baby et al., 2021). This finding aligns with the NOSACQ-50 theory, which identifies communication, management commitment, and worker involvement as the primary factors shaping safety climate. However, these results contradict those of Salcha et al. (2022), who found that higher-educated workers tend to have better risk awareness and a more positive attitude toward compliance with OSH procedures.

Furthermore, no significant correlation was found between work experience and safety climate. This indicates that longer work experience does not necessarily enhance safety perceptions, and newly hired employees can exhibit similar safety attitudes when the organization effectively implements standardized safety systems across all levels (Dewi et al., 2024). A study by Kutni et al. (2023) also supports this finding by reinforcing that safety behavior is more determined by organizational culture than by length of service. However, Zahira et al. (2025) found that greater work experience is associated with greater risk awareness and compliance with safety procedures, particularly in high-risk industries.

Finally, there is no significant correlation between job division and safety climate. This suggests that differences across departments or work units do not affect employees' perceptions of workplace safety, both before and after the Laporkan.id intervention. A uniform and inclusive implementation of safety management practices across divisions fosters a collective perception of safety within the organization (Riadianto & Sridadi, 2021). Supporting this view, Utama & Widanarko (2022) emphasized that effective safety management and communication, rather than job type or department, are key determinants of safety climate consistency. Nonetheless, (Puspitasari et al., 2023) found that variations in safety perception can emerge between underground and open-pit mining workers due to differences in risk exposure and managerial supervision.

The impact of implementing the Laporkan.id website on the safety climate of the experimental group

The results of the study show a significant increase in safety climate scores in the experimental group after the implementation of the Laporkan.id website-based hazard reporting system, as confirmed by the Paired t-Test (p<0,001). Beyond simplifying the reporting process, *Laporkan.id* enhanced transparency, accountability, and trust in management's commitment to

safety factors, thereby contributing to a stronger organizational safety culture (Arianto et al., 2022). This improvement aligns with the core principles of safety climate, which emphasize that safety perceptions are shaped by organizational communication, reporting, and responsiveness to safety issues (Qolbi & Muliawan, 2020).

The increase in safety climate can be attributed to three interrelated mechanisms. First, Laporkan.id improved the visibility and traceability of hazard reports, enabling employees to observe management's actions, thereby strengthening mutual trust. Second, the quick, documented feedback loop made workers feel their reports were valued, encouraging more active participation. Third, the ease of access and real-time hazard visualization promoted shared responsibility and situational awareness. These features created a sense of fairness and inclusion, reinforcing employees' belief in the system's credibility. (Wibawa et al., 2024).

Improvements across all NOSACQ-50 dimensions indicate positive behavioral changes following the *Laporkan.id* intervention. The largest increase occurred in Dimension 6 (safety communication, learning, and trust in coworkers' competence), reflecting enhanced transparency and interaction between employees and management. Meanwhile, Dimension 2 (empowerment) showed only slight improvement, likely due to the longer time required for structural and participatory changes.

Behaviorally, Laporkan.id operates as a digital feedback system that strengthens safety motivation and shared accountability. Real-time updates and traceable responses encourage proactive reporting and transform safety from an individual task into a collective organizational value (Naji et al., 2021). Its success, however, depends on an open reporting culture, management responsiveness, and workers' digital literacy (Heryati et al., 2019). The effectiveness of this intervention remains dependent on organizational factors, including the presence of an open reporting culture, management's commitment to follow up on reports, and workers' digital skills. Under these conditions, digital reporting acts as a catalyst, converting safety awareness into consistent safe behavior (Santoso et al., 2020).

The impact of implementing the Laporkan.id website on the safety climate of the control group

There was no significant difference between pre-test and post-test safety climate scores in the control group. Most respondents remained in the "Poor" or "Fairly Poor" categories, with only minimal changes across categories. This indicates that without digital hazard reporting media such as Laporkan.id, employees' perceptions of safety climate at PT X Surakarta remained low and relatively unchanged. Positive changes in workplace safety culture do not occur naturally but require active, systematic intervention (Safitri & Wicaksono, 2021).

Minor, inconsistent variations across NOSACQ-50 dimensions further support this conclusion. The largest increase, only 0.03 points, was in Dimension 2 (*empowerment*), likely resulting from routine safety discussions rather than genuine behavioral change. Small fluctuations in Dimension 4 (*workers' safety commitment*) may reflect normal attitudinal variation driven by workload or peer interactions (Abegaz et al., 2025). The drop in Dimension 5 (*risk awareness and rule compliance*) also indicates emerging complacency, a common effect when no new training or safety reminders are introduced (Sultan, 2021).

From a behavioral standpoint, these static results illustrate the absence of stimuli capable of triggering safety-related behavior change. Workers accustomed to limited participation in safety reporting tend to remain passive unless new mechanisms or incentives are introduced (Syafitri et al., 2025). Without transparent and responsive reporting channels, employees may perceive hazard reporting as inconsequential, weakening trust and engagement (Setyaningsih et al., 2023). Mechanistically, when an organization lacks an interactive platform like Laporkan.id, the feedback loop, awareness, trust, and new experiences are not formed. Consequently, safety perceptions remain unchanged.

This finding is reinforced by Nurrohman & Khairunnisa's (2025) study, which shows that the control group without training or digital media did not show significant changes in safety

scores in the K3 intervention study based on PPE and safety communication. Therefore, the absence of change in the control group is a logical outcome of unchanged organizational systems and reinforces the critical role of structured, technology-based interventions such as Laporkan.id in fostering a proactive and adaptive safety climate.

Changes in safety climate after implementation of the Laporkan.id website between the experimental and control groups

The Mann–Whitney U Test results ($p < 0,001$) indicated a significant difference in post-test safety climate scores between the experimental and control groups. This finding demonstrates that implementing the Laporkan.id digital hazard reporting system improved workers' safety perceptions compared to those without intervention, consistent with Sinaga et al. (2019), who reported a 17% increase in safety perception through digital reporting tools.

The gap between groups can be attributed to differences in reporting mechanisms and behavioral reinforcement. The experimental group benefited from Laporkan.id, which enabled transparent, traceable, and efficient hazard reporting, strengthening workers' perceptions that safety reporting is valued and acted upon (Sultan, 2021). In contrast, the control group relied on slow, undocumented conventional systems, limiting feedback and reducing the perceived relevance of reporting (Mohammadfam et al., 2022). These structural disparities shaped collective attitudes toward safety, reflected in the divergent safety climate scores.

From a behavioral perspective, digital reporting platforms like Laporkan.id encourage active engagement by providing immediate feedback that rewards reporting behavior and increases perceived control over workplace risks. This mechanism fosters trust, communication, and participation, key dimensions of a strong safety climate (Syed-Yahya et al., 2022). By making reporting accessible, anonymous, and documented, Laporkan.id reinforces positive safety habits and transforms safety from a managerial directive into a shared behavioral norm (Salsabila & Wahyuningsih, 2023).

Supporting studies show that digital OSH systems accelerate hazard response, strengthen organizational accountability, and promote collective trust in safety management (Irawati et al., 2021). However, the effectiveness of such systems depends on organizational readiness and digital culture (Suprianto et al., 2024). Overall, these findings suggest that Laporkan.id operates not only as a technical innovation but also as a behavioral and cultural catalyst that can shift employee perceptions and actions toward proactive safety engagement when supported by strong managerial commitment and integration into company policies.

CONCLUSION

Based on the statistical analysis, the implementation of the digital hazard reporting website, Laporkan.id, was shown to have a significant impact on improving the safety climate at PT X Surakarta. There was no significant relationship between demographic factors of respondents, such as age, education, length of service, and field of work, with safety climate scores. These findings indicate that digital hazard reporting technology interventions play a more dominant role in shaping workplace safety perceptions than individual characteristics, making Laporkan.id an effective and inclusive approach to enhancing workplace safety culture.

AUTHOR'S DECLARATION

Authors' contributions and responsibilities

AN: Writing the Original Draft, Visualization, Conceptualization; funding research; **HS:** Assisting with reviews, validating concepts and results, funding research; **NSSN:** Assisting with reviews, validating concepts and results.

Funding
The author privately funded this research.

Availability of data and materials
All data used in this study are available from the authors.

Competing interests
The authors declare no competing interests.

Additional information
There is no additional information about this study.

ACKNOWLEDGEMENT

The author would like to express his deepest gratitude to the management of PT X Surakarta for their permission and support, which enabled this research to be conducted with the involvement of workers as respondents. Thanks are also extended to all PT X Surakarta workers who actively participated in the data collection process. In addition, the author would like to thank all parties who provided assistance and support during the implementation of this research.

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