The Relationship Between The Implementation of a CCTV-Based Monitoring System and Compliance With Ppe Usage at The Lrt Jakarta Propertindo Velodrome – Manggarai Project Site KSO PT Len Railway System 2024

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Abstract

Implementation of occupational safety and health is one part of the workforce protection aspect to achieve optimal work productivity. In connection with the implementation of occupational safety and health, the use of Personal Protective Equipment is an effort to protect or prevent potential dangers or work accidents. To describe the relationship between the implementation of CCTV-based monitoring and compliance with the use of Personal Protective Equipment among Jakarta Propertindo Lintas Velodrome - Manggarai LRT project workers in 2024. This research uses a correlative descriptive quantitative research design with the approach used is a Cross Sectional Study conducted on 30 Technician Employees at the Jakarta Propertindo Lintas Veledrome – Manggarai LRT project. The results in this research i statistical results using chi square obtained a P-Value = 0.019 with a degree of confidence or α of 5% (0.05), because the P-Value is 0.019 < α value (0.05) meaning that Ho is rejected so it can be It is concluded that this means Ha is accepted or there is a relationship between the Implementation of a CCTV-Based Monitoring System and Compliance with the Use of PPE at the LRT Jakarta Propertindo Lintas Veledrome - Manggarai KSO Project Location of PT Len Railways Systems.

Keywords: Monitoring System, Compliance, Use of PPE, Cross Sectional.

1. Introduction

The Industrial Revolution 4.0 era has become a highly disruptive issue recently, with its effects felt both in Indonesia and worldwide. Technology is an incoming tool that serves as both an instrument and a facilitator to ease human life. Advances in science and technology have continually helped to provide more specific and explicit meanings to various terms over the years. The emergence of steam engines played a crucial role in making manufacturing processes more efficient [1]. The evolution continued with the discovery of electricity during the Industrial Revolution 2.0, followed by the rise of computerization in the 20th century, marking the Industrial Revolution 3.0 and leading up to today's civilization.

The Industrial Revolution 4.0 has brought significant changes in how industries operate by integrating advanced digital technologies such as the Internet of Things (IoT), Artificial Intelligence (AI), and automation. This transformation not only enhances efficiency and productivity but also presents new challenges in terms of Occupational Safety, Health, and Environment (K3L). As new technologies are adopted, companies must adjust and update their K3L policies to align with increasingly complex and automated work environments. Therefore, this study aims to explore the relationship between the implementation of Industry 4.0, artificial intelligence, and its impact on K3L, focusing on how emerging technologies influence and improve safety and health management systems, as well as their overall impact on the workplace. By gaining a deep understanding of these interactions, effective solutions can be found to optimize the benefits of Industry 4.0 while mitigating potential risks.

The rate of construction-related workplace accidents in Indonesia remains concerning. In 2015, 2,375 workers lost their lives due to workplace accidents, according to Juan Somavia, Director-General of the International Labour Organization (ILO) (Baja Contractor, 2017). According to records up to the second semester of 2023, workplace accidents in Indonesia, based on BPJS employment membership categories, reported 347,855 cases among wage workers, 19,921 cases among non-wage workers, and 2,971 cases in the construction sector. Dominggus Manuputty, Secretary General of the Indonesian Association of Construction Occupational Safety and Health Experts (A2K4I), stated that the construction industry is among the most vulnerable to workplace accidents, followed by manufacturing and the food and beverage industries. Even in developed countries, construction-related workplace accidents still require serious attention.

Implementing workplace safety and health measures is crucial for worker protection and achieving optimal work productivity. One key aspect of workplace safety is the use of Personal Protective Equipment (PPE) to prevent potential hazards or workplace accidents. PPE usage is essential, as studies in Indonesian companies have found that 60% of workers suffered head injuries due to not wearing safety helmets, 90% suffered facial injuries due to the absence of facial protection, 77% had foot injuries due to the lack of safety shoes, and 68% sustained eye injuries due to not using eye protection.

Jakarta Integrated Light Rail Transit (LRT Jakarta) is a rail transit system operating in Jakarta. Currently, LRT Jakarta has a 5.8 km line serving six stations. It is owned and developed by the Jakarta Provincial Government, with operations managed by PT LRT Jakarta, a subsidiary of PT Jakarta Propertindo (Perseroda), a regionally owned enterprise. The system's construction began in June 2016 and became fully operational on December 1, 2019. LRT Jakarta is currently extending its line from Velodrome Station to Manggarai, covering a distance of 6.4 km with five additional stations: Rawamangun, Pramuka BPKP, Pasar Pramuka, Matraman, and ending at Manggarai Station.

Initial observations conducted at the Velodrome-Manggarai LRT Project in July 2024 revealed non-compliance with PPE usage. Some workers were found without complete PPE, including safety helmets, safety shoes, and vests, despite working in environments that posed accident risks. Interviews with workers and field observations showed that out of eight interviewed workers, two admitted to not complying with PPE regulations, citing discomfort. Additionally, safety officers often failed to issue serious warnings when witnessing non-compliance. This indicates a lack of strict supervision, which could lead to workplace accidents.

According to the HSE Officer of PT Len Railways System at the LRT Jakpro Phase 1B project site, the current monitoring system for PPE compliance is still ineffective and inefficient, particularly for outdoor technicians. The lack of supervision has led to widespread non-compliance, increasing safety risks at the project site. Moreover, non-compliance results in verbal warnings from the local KSO and even temporary work stoppages until safe work permits, including mandatory PPE usage, are met.

Given the importance of PPE usage and the potential dangers of non-compliance, as well as the crucial role of routine safety supervision, this study aims to investigate "The Relationship Between CCTV-Based Monitoring System Implementation and PPE Compliance at the LRT Jakarta Propertindo Velodrome - Manggarai Project by PT Len Railway System."

2. Methods

This research adopts a descriptive-correlational quantitative design. Correlational research, according to Notoatmodjo [2], examines the relationship between two or more variables without modifying, adding, or manipulating existing data. In this study, researchers will identify the CCTV-Based Monitoring System and PPE Compliance and analyze their relationship without altering the existing data.

The study employs a cross-sectional approach, which examines the relationship between risk factors (independent variables) and effects (dependent variables) to determine correlations. This approach involves simultaneous data collection, observation, or measurement at a single point in time.

Each research subject is observed only once, and variables are measured at the time of assessment. Both the implementation of the CCTV-Based Monitoring System and PPE Compliance will be assessed concurrently.

The research methodology is divided into the following stages:

2.1. Preparation Stage

1. Determining the research topic, which is based on field phenomena and existing scientific theories.
2. Conducting a preliminary study at the PT Len Railways System head office to review PPE compliance data.
3. Performing a literature review using academic books and research journals from the last ten years.
4. Formulating the research problem based on observed field phenomena. The research problem in this study is: "Is there a relationship between CCTV-Based Monitoring System Implementation and PPE Compliance among technical employees?"
5. Developing the research proposal, which began in October 2024.

2.2. Implementation Stage

6. Obtaining research permits, issued by the HSE Officer of PT Len Railway System for the LRT Jakarta Propertindo Velodrome – Manggarai project.
7. Securing informed consent from respondents, ensuring anonymity and confidentiality, and respecting respondents' rights. Participation is voluntary.
8. Data collection, which includes field observations of the AI-based CCTV monitoring system implementation and distributing PPE compliance questionnaires to PT LRS technicians working on the project.
9. Data processing, involving editing, coding, entry, and cleaning.
10. Data analysis, using univariate and bivariate statistical analysis.

2.3. Final Stage

After collecting all data, researchers will categorize, analyze, and present the findings using statistical analysis software. The final research report, consisting of Chapter IV (Research Results) and Chapter V (Discussion), will be compiled.

3. Result and Discussion

This research was conducted over one month, from September 2024 to October 2024, at LRT Jakarta Phase 1B. The study aims to determine the relationship between the implementation of a CCTV-based monitoring system and compliance with PPE usage at the project site, with a total of 30 respondents. The collected data was processed and analyzed using univariate and bivariate analysis. The research findings are as follows:

3.1. Distribusi Frekuensi Responden

a. Respondent Monitoring

CCTV-based monitoring is a technological tool supported by technology to analyze images and audio from cameras.

Table 1. Respondent Frequency Distribution Based on the Monitoring Variable at PT. Len Railway System in 2024

Chategories	Frequency	Percent (%)
High	17	56,7
Medium	11	36,7
Low	2	6,6
Total	**30**	**100,0**

Based on the table above, it is found that in this study, there were 17 respondents (56.7%) with high supervision, while 2 respondents (6.6%) experienced low supervision.

b. PPE (Personal Protective Equipment) Compliance of Respondents
Personal Protective Equipment (PPE) is used by workers to protect themselves from potential hazards in the workplace. Its proper use is expected to minimize the risk of occupational diseases (PAK) and work-related injuries. PPE should be implemented when technical and administrative control measures have been applied but do not fully eliminate hazards, leaving significant risks. Therefore, PPE serves as the last line of defense in hazard control, which is especially crucial in the construction sector, known for its high-risk environment. However, if PPE is not used correctly, it will not function optimally in protecting workers. This means that any hazard control measures taken could be ineffective if PPE compliance is not ensured.

Table 2. Respondent Frequency Distribution Based on PPE Compliance at PT. Len Railway System in 2024

Chategories	Frequency	Percent (%)
Obedient	22	73,4
Disobedient	8	26,6
Total	**30**	**100,0**

Based on the table above, the study found that 22 respondents (73.4%) fell into the compliant category, while 8 respondents (26.6%) were classified as non-compliant.

c. Bivariate Analysis Results
To determine the relationship between the independent variable (monitoring) and the dependent variable (PPE compliance) in the LRT Jakarta Phase 1B project, a bivariate analysis was conducted using statistical methods with the Chi-Square test.

Table 3. Chi-Square Test Results for PPE Compliance Monitoring at PT. Len Railway System in 2024

Monitoring	Disobedient	%	Obedient	%	Total	P Value
High	2	25	15	68,2	17 (100%)	0,019
Medium	4	50	7	31,8	11 (100%)	
Low	2	25	0	0	2 (100%)	
Total	**8**	**100&**	**22**	**100%**	**30**	

Monitoring with compliance in the use of Personal Protective Equipment (PPE) found that 17 respondents with high monitoring had 2 respondents who were non-compliant, and 15 respondents who were compliant, while 11 respondents with moderate monitoring had 7 respondents who were compliant and 4 respondents who were non-compliant, and there were 2 respondents with low monitoring, both of whom were non-compliant. From the statistical results using the chi-square test, a P-Value = 0.019 was obtained with a confidence level or α of 5% (0.05). Since the P-Value 0.019 < α (0.05), it means that Ho is rejected, so it can be concluded that Ha is accepted or that there is a relationship between the Implementation of the CCTV-Based Monitoring System and Compliance with PPE Usage at the LRT Jakarta Propertindo Velodrome – Manggarai Project, KSO PT Len Railway System.
The results of this study are in line with Notoatmodjo's theory [2], which states that supervision is essential to ensure worker performance in the implementation of occupational health and safety (OHS) in a company. According to Sondang, supervision is a process of observation and implementation carried out to ensure that all ongoing work runs according to the predetermined plan. Field observations found that supervisors were not strict enough in monitoring workers who did not comply with PPE usage. Workers who stated that supervision was high felt they were always being watched by management in every movement they made. Workers would be more cautious and

focused on their work because they feared reprimands from supervisors. High supervision can support worker compliance with PPE usage. Conversely, workers stated that low supervision made them feel unmonitored and without pressure from management, making them more careless at work and more likely to ignore existing hazards. Workers who feel that supervision is low will act as they please and pay less attention to their performance. Low supervision of workers can lead to non-compliance with PPE usage.

According to Bird and Germain (1996), one of the determining factors for the success of workplace safety supervision is the supervisor themselves. Supervisors hold a key position in influencing the knowledge, attitudes, skills, and habits regarding safety of every employee within their area of responsibility. Therefore, efforts that can be made by the company include increasing the role of supervisors. Supervisors should be stricter and more disciplined, and supervision should be conducted unexpectedly without the workers' prior knowledge.

4. Conclusion and Suggestion

4.1. Conclusion

Based on the research findings on the relationship between the implementation of a CCTV-based monitoring system and compliance with the use of Personal Protective Equipment (PPE) at the LRT Jakarta Propertindo project site (Velodrome – Manggarai section), the following conclusions can be drawn:

1. Among the 17 technician respondents under high monitoring, 2 respondents exhibited non-compliant behavior, while the remaining 15 respondents demonstrated compliance at the LRT Jakarta Phase 1B project.
2. A total of 11 respondents were under moderate monitoring, with 7 respondents exhibiting compliant behavior and 4 respondents displaying non-compliant behavior at the LRT Jakarta Phase 1B project.
3. There is a correlation between the level of monitoring and compliance with PPE usage at the project site.

4.2. Suggestion

Proper planning by the project's legal department is necessary to establish policies regarding monitoring, including:

1. Increasing the number of CCTV units in the work area.
2. Rescheduling technicians' working hours.
3. Improving or enhancing the existing monitoring system to ensure higher compliance with PPE usage among technicians.

It is hoped that the findings of this study will serve as a reference and reading material to expand knowledge, particularly on PPE compliance and the importance of high monitoring levels.

For future researchers, it is recommended to further explore the relationship between CCTV-based monitoring systems and PPE compliance, as many other factors also influence PPE usage.

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