JOURNAL ECONOMINA
e-ISSN: 2963-1181
Volume 5, Number 10, October 2026
Homepage: ejournal.45mataram.ac.id/index.php/economina

Safety Culture as a Mediator of the Influence of Artificial Intelligence-Based Sustainable Human Resource Management on Employee Performance

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Article History
Received: 03-10-2026
Revised: 09-10-2026
Published: 30-10-2026

Keywords: Artificial Intelligence, Employee Performance, Safety Culture, Sustainable Human Resource Management, Pls-Sem.

ABSTRACT

Digital transformation drives the integration of artificial intelligence in human resource management (HRM) to improve sustainability and performance. In the mining industry, these benefits are expected to occur not only directly but also through safety culture. This study aims to analyze the effect of AI-based sustainable HRM on employee performance and examine the mediating role of safety culture. The study used a quantitative explanatory approach on 54 employees of PT. Jaya Nikel Pasific. Three main constructs were analyzed using *Partial Least Squares Structural Equation Modeling* with a hierarchical model and a *disjoint two-stage approach* . The results show that AI-based sustainable HRM has a positive effect on employee performance (β=0.357; p=0.001) and safety culture (β=0.615; p<0.001). Safety culture has a positive effect on employee performance (β=0.424; p<0.001). The indirect effect through safety culture is also significant (β=0.261; p=0.002), thus indicating *complementary partial mediation* . The model explained 49.4% of the variation in employee performance. The findings confirm that the application of artificial intelligence in HRM in the mining industry needs to be integrated with strengthening the work environment, communication, and safety leadership .

INTRODUCTION

Digital transformation has shifted the human resource management (HRM) function from primarily administrative activities to increasingly analytical, predictive, and data-driven workforce management. Artificial intelligence enables organizations to filter information, recognize competency patterns, provide learning recommendations, support performance evaluations, and generate faster decisions. Recent literature shows that the interaction between AI and HRM brings both benefits and risks to employees and organizations, so its implementation needs to be viewed as a socio-technical system, not simply a software adoption (Pereira et al., 2023; Malik et al., 2023; Basu et al., 2023).

These developments have led to the emergence of the concept of Sustainable Human Resource Management (HRM) supported by artificial intelligence, namely the use of artificial intelligence to strengthen HRM practices oriented towards workforce sustainability, well-being, participation, competency development, decision quality, and long-term value creation. Jia and Hou (2024) show that Sustainable HRM Based on Artificial Intelligence can be explained through the *Ability-Motivation-Opportunity* (AMO) framework, technology can enhance capabilities through personalized learning and identification of competency gaps, strengthen motivation through data-based feedback and recognition, and expand opportunities to contribute through information, collaboration, and decision support. Subsequent studies also confirmed that HRM supported by Artificial Intelligence can be connected to sustainable performance when digital culture, organizational strategy, and HRM practices are aligned (Mollah et al., 2024).

While technology opens up opportunities for performance improvement, the literature on Human Resource Management with Artificial Intelligence also warns of the risks of algorithmic bias, excessive oversight, low transparency, technostress, reduced autonomy, and employee distrust. Bujold et al. (2024) suggest that *responsible* AI in HRM requires governance, transparency, and human oversight. to ensure that algorithm-based decisions remain accountable. Ekuma (2024) also emphasized the importance of developing human capabilities when automation and artificial intelligence are integrated into HR development processes. Thus, the success of AI in HR cannot be measured solely by efficiency, but also by the quality of work experience and the sustainability of human resources.

The concept of Sustainable Human Resource Management is becoming increasingly important because it positions people as resources that must be maintained in the long term, not simply as production inputs. Lu et al. (2023) showed that Sustainable Human Resource Management practices can improve employee resilience, job engagement, and performance. through the work resource pathway. Liang and Li's (2025) systematic review shows that the relationship between Sustainable Human Resource Management and employee performance is multidimensional and influenced by various mediators and boundary conditions. This raises the need to identify contextual mechanisms that explain how sustainable HRM practices translate into performance in sectors with high safety demands.

The mining industry is a relevant context for testing these mechanisms because operational activities involve physical risks, heavy equipment, target pressure, dynamic environmental conditions, and a high reliance on human-technology coordination. A study by Ismail et al. (2021) showed that safety culture in mining is built through psychological, situational, and behavioral dimensions, with management commitment being a crucial factor. Tetzlaff et al. (2021) also showed that safety culture frequently emerged as a factor in analyses of mining incidents, indicating that occupational risks are inseparable from organizational values, practices, and decision-making patterns.

Safety culture describes the values, priorities, habits, communication, work environment, and leadership behaviors that indicate the extent to which safety is placed at the core of

operations. In high-risk industries, safety culture extends beyond the availability of procedures, but also encompasses whether production targets align with safety requirements, whether employees can openly report risks, whether safety resources are available, and whether leaders provide consistent examples and support. Naji et al. (2022) found that safety culture is related to workplace safety and that communication plays a critical role in bridging culture with safety behavior.

Research in mining also shows that organizational conditions and safety climate influence worker behavior and performance. Yu et al. (2022) found that psychosocial safety climate is positively related to miner safety behavior through organizational support and mental health. Quansah et al. (2023) showed that safety leadership is a key safety concern for contract miners through employee engagement and psychological safety. Han and Li (2024) also found that safety climate plays a role in the mechanism linking miners' job engagement and safety. These findings suggest that safety can function as an organizational resource that influences work behavior.

However, the majority of safety literature focuses on outcomes in safety behavior, compliance with safety standards, or safety performance. The relationship between safety culture and broader employee performance, namely task performance and contextual performance, has not received comparable attention. Yet, in mining environments, safe working conditions and clear communication can reduce uncertainty, increase concentration, improve coordination, and enable employees to use their abilities more effectively. Zhou et al. (2024) demonstrated that working conditions in the coal mining sector are related to task performance and compliance with safety standards through a Job Demands -Resources perspective. Milošević et al. (2025) also demonstrated that organizational climate factors, support, training, employee involvement, and management commitment are related to safety satisfaction and the safety of mining operators.

In terms of AI and performance, the literature also shows that the mechanisms by which technology influences employees are not yet fully uniform. Prikshat et al. (2023) proposed an AI-enabled Human Resource Management framework that emphasizes the consequences for individuals, human resource functions, and organizations. Pei et al. (2024) demonstrated that AI-based *feedback* can improve *job performance* when employee design characteristics and responses are appropriately managed. Singhwal and Bansal (2026) further positioned AI-enabled Human Resource Management as a conditional organizational capability; sustainable value emerges when the transformation of HR practices, employee experience, decision quality, *digital readiness* , and ethical governance are aligned.

Based on this mapping, four research gaps exist. First, the literature on *AI-enabled* Sustainable Human Resource Management (SHM) still primarily discusses engagement, resilience, decision quality, or sustainable performance, while the formation of a safety culture as an organizational mechanism has not been extensively examined. Second, the literature on safety culture in mining focuses more on examining safety outcomes than on employee performance in general. Third, the mediators in the relationship between SHM and employee

performance are still dominated by individual psychological mechanisms, while organizational mechanisms contextual to high-risk sectors are relatively limited. Fourth, the integration of artificial intelligence with SHM, safety culture, and employee performance in a single empirical model in the Indonesian mining sector has not been adequately explored. The novelty of this research lies in the placement of safety culture as an organizational mechanism that explains how AI-based sustainable HRM translates into employee performance in high-risk industries.

Theoretically, this study uses the AMO theory as the primary foundation and the JD-R as a supporting theory. AMO explains that HR practices will improve performance when organizations strengthen capabilities, motivation, and opportunities. The JD-R explains that safety culture can be viewed as an organizational resource that reduces uncertainty, supports coordination, and helps employees cope with job demands. The integration of these two perspectives allows the study to explain the effects of HR-technology on performance as well as the safety mechanisms that link the two.

Based on AMO theory, artificial intelligence for Sustainable Human Resource Management provides practices that enhance competency, provide feedback and motivation, and create opportunities for participation in decision-making and innovation. Jia and Hou (2024) found that artificial intelligence for Sustainable Human Resource Management is positively related to performance through engagement mechanisms. Mollah et al. (2024) also demonstrated the relevance of artificial intelligence for sustainable human resource management. Therefore, the use of artificial intelligence directed at human resource sustainability is expected to improve employees' ability to complete tasks and provide contextual contributions.

H1: Artificial intelligence-based sustainable HR management has a positive effect on employee performance.

AI-based HRM practices can also strengthen safety culture through competency mapping, training recommendations, workload analytics, *feedback* , risk communication, and more consistent decision-making. Mining literature shows that management commitment, the work environment, communication, and training are critical components in shaping work culture (Ismail et al., 2021; Milošević et al., 2025). Because AI practices for Sustainable HRM influencing HR development, communication, and decision-making processes, these practices are thought to be *antecedents* to safety culture.

H2: Artificial intelligence-based sustainable HR management has a positive effect on safety culture.

Safety culture provides organizational resources in the form of clear procedures, leadership support, safer working conditions, and open risk communication. From the JD-R perspective, these resources help employees cope with job demands, maintain focus, and sustain productivity. Empirical evidence shows that safety culture and safety climate are related to safety performance, engagement, and work behavior in high-risk industries (Naji et al., 2022; Quansah et al., 2023; Han & Li, 2024). Therefore, safety culture is expected to positively contribute to employee performance, encompassing both task and contextual performance.

H3: Safety culture has a positive effect on employee performance.

If artificial intelligence with Sustainability of Human Resource Management can strengthen safety culture, and safety culture, in turn, improves performance. Therefore, some of the influence of AI-based HR practices is expected to occur through safety mechanisms. This position expands on previous research that primarily used engagement or resilience as mediators (Jia & Hou, 2024; Lu et al., 2023), by offering organizational mechanisms that better suit the characteristics of mining.

H4: Safety culture mediates the effect of artificial intelligence-based sustainable HR management on employee performance.

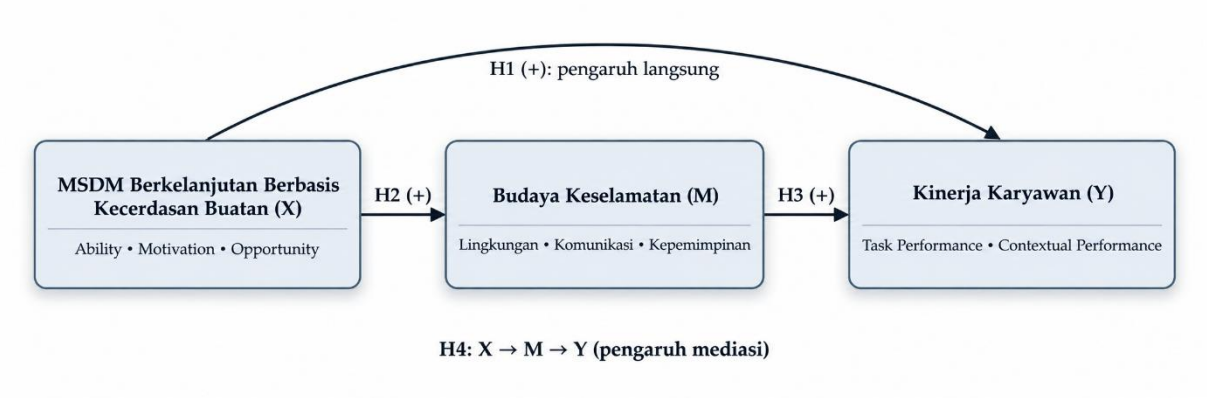


Figure 1. Conceptual framework of the research

(Source: Processed by the author based on the results of problem analysis)

Based on this framework, the aim of the research is to test the direct influence of artificial intelligence on Sustainability of Human Resource Management. on employee performance, testing the influence of artificial intelligence on Sustainable Human Resource Management on safety culture, testing the influence of safety culture on employee performance, and testing the mediating role of safety culture in the relationship between artificial intelligence and Sustainable Human Resource Management. and employee performance at PT. Jaya Nikel Pasific .

RESEARCH METHODS

The study employed a quantitative explanatory approach with a cross-sectional design. The unit of analysis was employees of PT. Jaya Nikel Pasific working in the mining industry. Analytical data consisted of 54 completed responses. Respondents were selected based on criteria: employees with sufficient work experience to assess organizational conditions and exposure to digital or analytical systems that support work and HR management. The instrument was designed without requiring direct personal identification, allowing responses to be analyzed anonymously.

The construct of artificial intelligence with Sustainable Human Resource Management is operationalized as a high-level construct formed by three lower-level constructs: capability enhancement, motivation enhancement, and opportunity enhancement. The initial instrument consists of 15 indicators conceptually adapted from Jia and Hou's (2024) framework for

Sustainable Human Resource Management. Capability includes competency gap identification, training recommendations, competency development, placement, and career development. Motivation includes *feedback* , assessment, well-being management, decision consistency, and goal achievement encouragement. Capability includes decision support, process improvement, collaboration, work arrangements, and opportunities to contribute to innovation, safety, and sustainability.

Safety culture was measured using 16 indicators adapted from Naji et al. (2022) across three dimensions: work environment, organizational communication, and safety leadership. Work environment assesses the balance between targets and safety, time adequacy, working conditions, personnel, safety equipment, and a sense of security. Organizational Communication measures the quality of safety information, supervisor communication, transparency in reporting, hazard information updates, and appreciation of safe behavior. Safety leadership measures clarity of responsibilities, leadership commitment, support for improvement, safety goals, and inter-unit coordination.

Employee performance is shaped by task performance and contextual performance with a total of 10 indicators. Task performance measures goal achievement, standard fulfillment, competency, core responsibilities, and job organization. Contextual performance assesses behaviors such as helping coworkers, supporting the organization, assisting new employees, providing improvement ideas, and making additional contributions. The structure of task and contextual performance is consistent with the conceptualization of employee performance in the Sustainability Human Resource Management literature (Liang & Li, 2025) and the measurement used in Jia and Hou's (2024) study. All indicators are assessed using a five-point Likert scale.

The analysis was conducted using *Partial Least Squares Structural Equation Modeling* (PLS-SEM) because the model contains hierarchical constructs, mediating effects, and a prediction orientation. PLS-SEM is suitable for complex models, high-level constructs, data conditions that do not strictly meet multivariate normality, and studies that emphasize explanation and prediction (Hair & Alamer, 2022; Legate et al., 2023). Higher-order constructs are estimated using a separate two-stage approach, where lower-order component scores are used as indicators at the higher-order stage.

Evaluation of the reflective measurement model includes *outer loading, Cronbach's alpha, rho_A, composite reliability, average variance extracted* (AVE), and *heterotrait-monotrait ratio* (HTMT). *Outer loadings* of around 0.70 or more are prioritized; indicators in the range of 0.40-0.70 are evaluated based on their impact on reliability, convergent validity, discriminant validity, and content validation. Criteria for reliability of at least 0.70, AVE of at least 0.50, and HTMT below 0.90 are used as references. At the high-level construct, evaluation of outer weight, outer loading, and variance inflation factor (VIF) is carried out. The structural model is evaluated through *path coefficient* , R^2, f^2, Q^2_predict, VIF, and *specific indirect effect* . Significance is tested through *bootstrapping* 10,000 resamples with *a two-tailed test* , 5% level, and 95% *confidence interval* .

Table 1. Operationalization of research variables

Construct	Dimensions	Early indicators	Source
Artificial Intelligence Sustainability Human Resource Management	Ability	5	Jia & Hou (2024)
Artificial Intelligence Sustainability Human Resource Management	Motivation	5	Jia & Hou (2024)
Artificial Intelligence Sustainability Human Resource Management	Opportunity	5	Jia & Hou (2024)
Safety culture	Work environment	6	Naji et al. (2022)
Safety culture	Organizational communication	5	Naji et al. (2022)
Safety culture	Leadership in the field of safety	5	Naji et al. (2022)
Employee performance	Task performance	5	Jia & Hou (2024)
Employee performance	Contextual performance	5	Jia & Hou (2024)

Source: Research instruments adapted and contextualized for the mining industry, 2026 .

RESULTS AND DISCUSSION

Descriptive Statistics

The research data consisted of 54 completed questionnaires. At the construct level, AI-based sustainable human resource management had a mean score of 3.336 with a standard deviation of 0.881; safety culture had a mean score of 3.337 with a standard deviation of 0.846; and employee performance had a mean score of 3.381 with a standard deviation of 0.845. These scores indicate that respondents' perceptions of the three constructs were at a moderate to high level. Among the three constructs, employee performance showed the highest mean score, although the difference was relatively small compared to AI-based sustainable human resource management and safety culture .

Table 2. Descriptive statistics of constructs

Construct	Mean	Standard deviation
AI-Powered Human Resource Management Sustainability	3,336	0.881
Safety Culture	3,337	0.846
Employee performance	3,381	0.845

Source: Processed research data, 2026

At the dimension level, ability had an average value of 3.278, motivation 3.363, and opportunity 3.356. In the safety culture construct, the work environment had an average value of 3.380, organizational communication 3.315, and safety leadership 3.307. Meanwhile, task performance had an average value of 3.337 and contextual performance 3.426. Contextual performance was the dimension with the highest average value, while ability had the lowest average value. This pattern indicates that collaborative behavior, initiative, and additional

employee contributions have developed relatively well. However, the aspect of utilizing artificial intelligence-based technology to support the improvement of employee abilities and competency development still has room for improvement.

Evaluation of Measurement Model

The initial model consisted of 41 indicators. The evaluation results showed that most indicators had adequate external loading values. Indicator V_A1 on the capability dimension had a loading value of 0.639, while indicator Y_CP3 on the contextual performance dimension had a value of 0.667. Indicator V_A1 was removed because its removal increased the average value of the variance extracted on the capability dimension from 0.619 to 0.695, while simultaneously decreasing the heterotrait-monotrait ratio between the capability and motivation dimensions from 0.910 to 0.889. Meanwhile, indicator Y_CP3 was retained because its composite reliability value and average variance extracted on the contextual performance dimension still met the established criteria, and the indicator was still needed to maintain the representativeness of the construct content. Thus, the final model of the study used 40 indicators.

In the final model, Cronbach's alpha values ranged from 0.804 to 0.915, rho_A from 0.814 to 0.918, composite reliability from 0.866 to 0.937, and average variance extracted from 0.565 to 0.748. All first-level constructs met the requirements for internal consistency and convergent validity. These results indicate that the indicators used are able to consistently represent the latent constructs and have adequate levels of reliability and measurement validity.

Table 3. Reliability and convergent validity of the final model

Construct	Alpha	rho_A	rho_C	AVE
Ability	0.849	0.855	0.901	0.695
Motivation	0.915	0.918	0.937	0.748
Opportunity	0.862	0.868	0.902	0.648
Work environment	0.914	0.917	0.934	0.702
Organizational communication	0.894	0.895	0.922	0.703
Leadership in the field of safety	0.837	0.841	0.885	0.608
Task Performance	0.875	0.878	0.910	0.669
Contextual Performance	0.804	0.814	0.866	0.565

Source: Processed research data, 2026

Discriminant validity was evaluated using the heterotrait-monotrait ratio. All construct pairs had values below the 0.90 threshold. The highest value of 0.889 was found in the relationship between the ability and motivation dimensions. Although this value slightly exceeds the conservative limit of 0.85, both dimensions are part of the same second-order construct, so the empirical closeness can still be explained theoretically. The decrease in the value from 0.910 to 0.889 after the removal of indicator V_A1 also indicates that the decision to eliminate this indicator was able to increase the separation between constructs and improve the model's discriminant validity.

High-Level Construct Evaluation

After the first-level construct measurement model met the criteria, the analysis continued using a separate two-stage approach. All first-level construct components had variance inflation factor values below 3.0, thus indicating no serious collinearity problems. In the AI-based sustainable human resource management construct, the opportunity dimension had the largest external weight of 0.719, followed by the ability dimension at 0.294 and motivation at 0.102. In the safety culture construct, safety leadership with an external weight of 0.547 and work environment at 0.506 were the relatively dominant components. Meanwhile, organizational communication had an external weight of 0.079, but its external content value remained substantive at 0.725. In the employee performance construct, task performance had an external weight of 0.641, while contextual performance had an external weight of 0.483.

Table 4. Evaluation of High-Level Constructs

Second Level Construct	First Level Components	External Weight	External Load	Variance Inflation Factor (VIF)
Artificial Intelligence-Based Sustainable HR	Ability	0.294	0.796	2,720
Artificial Intelligence-Based Sustainable HR	Motivation	0.102	0.782	2,929
Artificial Intelligence-Based Sustainable HR	Chance	0.719	0.955	1,708
Safety Culture	Work environment	0.506	0.890	2,061
Safety Culture	Organizational Communication	0.079	0.725	1,931
Safety Culture	Safety Leadership	0.547	0.899	1,715
Employee performance	Task Performance	0.641	0.919	1,498
Employee performance	Contextual Performance	0.483	0.852	1,498

Source: Processed research data, 2026

The dominance of the opportunity dimension indicates that the benefits of AI-based sustainable human resource management in the context of this study primarily lie in the technology's ability to provide information, improve work processes, facilitate collaboration, and provide space for employee participation. These findings align with Jia and Hou's (2024) finding that opportunity-oriented AI-based human resource management practices can improve employee access to information and opportunities to utilize their abilities productively. Regarding the construct of safety culture, the strong contribution of safety leadership and the work environment is consistent with the findings of Ismail et al. (2021) and Quansah et al. (2023) which show that leadership commitment and behavior are important factors in establishing a safety culture and improving safety performance .

Structural Model Evaluation

Artificial intelligence-based sustainable human resource management is able to explain 37.8% of the variation in safety culture with an R^2 value of 0.378. Furthermore, artificial intelligence-based sustainable human resource management together with safety culture is able to explain 49.4% of the variation in employee performance with an R^2 value of 0.494. The predictive Q^2 value for safety culture is 0.345 and for employee performance is 0.440. Both values are above zero, thus indicating that the model has adequate predictive relevance. The

size of the effect of artificial intelligence-based sustainable human resource management on safety culture is 0.608, on employee performance is 0.157, while the size of the effect of safety culture on employee performance is 0.221.

Table 5. Evaluation of the structural model

Connection	β	f^2	Variance Inflation Factor (VIF)	R^2 Endogenous Construct	Q^2 Predictive
Artificial Intelligence-Based Sustainable HRM → Safety Culture	0.615	0.608	1,000	0.378	0.345
Artificial Intelligence-Based Sustainable HR → Employee Performance	0.357	0.157	1,608	0.494	0.440
Safety Culture → Employee Performance	0.424	0.221	1,608	0.494	0.440

Source: Processed research data, 2026

Hypothesis Testing and Mediation

Hypothesis testing was conducted using a 10,000-fold resampling procedure. All direct and indirect relationships had 95% confidence intervals that did not cross the zero value. The results of the H1 test showed that AI-based sustainable human resource management had a positive and significant effect on employee performance (β=0.357; t=3.293; p=0.001). H2 showed that AI-based sustainable human resource management had a positive and significant effect on safety culture (β=0.615; t=7.357; p<0.001). H3 showed that safety culture had a positive and significant effect on employee performance (β=0.424; t=3.573; p<0.001). Furthermore, H4 showed that the specific indirect effect on the X→M→Y path was 0.261 (t=3.107; p=0.002). Thus, safety culture is proven to have a significant mediating role in the relationship between artificial intelligence-based sustainable human resource management and employee performance.

Table 6. Results of hypothesis testing

Hypothesis	Connection	β	t	p	95% Confidence Interval	Decision
H1	Artificial Intelligence-Based Sustainable HR → Employee Performance	0.357	3,293	0.001	0.141–0.567	Supported
H2	Artificial Intelligence-Based Sustainable HRM → Safety Culture	0.615	7,357	<0.001	0.436–0.760	Supported
H3	Safety Culture → Employee Performance	0.424	3,573	<0.001	0.176–0.646	Supported
H4	Artificial Intelligence-Based Sustainable HRM → Safety Culture → Employee Performance	0.261	3,107	0.002	0.104–0.433	Supported

Source: Processed research data, 2026

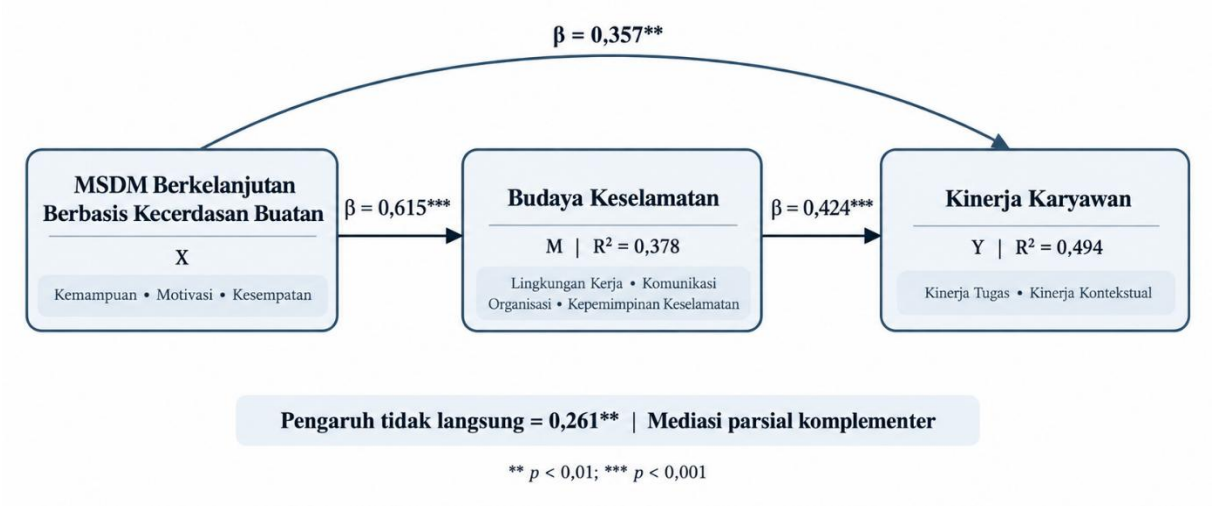


Figure 2. Results of the structural model of the research
Source: Processed research data, 2026

Discussion H1: Artificial intelligence-based sustainable HR management has a positive effect on employee performance.

The results of the H1 test indicate that AI-based sustainable human resource management has a positive and significant effect on employee performance. This finding strengthens the evidence that AI technology can provide added value when integrated into employee development practices, providing feedback, decision-making, and increasing employee participation. Jia and Hou (2024) found that AI-based sustainable human resource management can improve employee engagement and performance through a combination of ability, motivation, and opportunity. Pereira et al. (2023), Malik et al. (2023), and Prikshat et al. (2023) also emphasized that the results of implementing AI in the workplace are highly dependent on how the technology is integrated into human resource management functions and organizational systems.

The empirical findings of this study also support Mollah et al. (2024), who demonstrated that human resource management enhanced by artificial intelligence can contribute to sustainable performance when linked to digital culture and organizational strategy. In the mining context, these benefits are particularly significant because human resource management decisions must simultaneously consider technical competence, occupational safety, workload, and operational coordination. While AI can help provide more consistent, data-driven information, its success still depends on the quality of human resource management processes and employees' ability to understand and utilize that information.

The largest external weight of the opportunity dimension provides additional explanation for the H1 result. At PT. Jaya Nikel Pasific, the benefits of AI-based sustainable human resource management appear stronger when the technology opens access to information, facilitates work process improvements, and provides space for employees to contribute, compared to when the technology only functions as a monitoring mechanism. This result is also consistent with Pei et al. (2024), who showed that AI-based feedback can improve work performance if the

technology is designed and perceived as a form of support for employees. Thus, the application of AI in human resource management should be directed at strengthening human capabilities, not simply replacing or automating work functions.

Discussion H2: Artificial intelligence-based sustainable HR management has a positive effect on safety culture.

The H2 test results yielded the strongest influence coefficient in the model, namely β = 0.615. These results indicate that AI-based sustainable human resource management has a strong relationship with safety culture. Theoretically, practices that enhance employee capabilities, provide feedback, improve work scheduling, monitor workloads, and provide information about risks can strengthen the work environment, organizational communication, and safety leadership. This finding expands the study of AI in human resource management because the benefits of technology go beyond efficiency or performance improvement, but can also translate into the creation of a safer organizational environment.

These results align with Ismail et al.'s (2021) systematic review, which identified management commitment, training, communication, and situational conditions as key elements in shaping a safety culture in the mining sector. Tetzlaff et al. (2021) also demonstrated that safety culture is a recurring theme in various mining safety reports and is related to how organizations interpret and manage risks. If artificial intelligence systems are used to support training needs analysis, workforce planning, fatigue monitoring, or safety feedback, these technologies can become part of an organizational infrastructure that helps management demonstrate a more consistent commitment to safety.

Singhwal and Bansal (2026) emphasize that AI-based human resource management can generate sustainable value when supported by integrated digital capabilities, human resource management routines, employee experience, and ethical governance. This is particularly relevant in the context of occupational safety. The use of AI that is not transparent or solely directed at monitoring can undermine employee trust. Conversely, if AI is used to support competency development, workload management, and improve decision-making, the technology can strengthen employee confidence that the organization truly places safety as a top priority.

Discussion H3: Safety culture has a positive effect on employee performance.

The results of the H3 test indicate that safety culture has a positive effect on employee performance. This finding extends previous studies that primarily link safety culture or climate to safety behavior and safety performance. Naji et al. (2022) demonstrated that safety culture is related to employee safety performance, while Yu et al. (2022) demonstrated that psychosocial safety climate can improve mine workers' safety behavior through organizational support and mental health. Quansah et al. (2023) also found that safety leadership is related to workplace safety through employee engagement and a sense of psychological safety.

In this study, the measured outcomes were not limited to safety performance, but included task performance and contextual performance. This relationship can be explained through the

theory of job demands and resources, namely that safety culture provides job resources in the form of clear procedures, organizational support, communication, equipment availability, and protection that help employees cope with job demands. Zhou et al. (2024) showed that working conditions in the coal mining sector are related to compliance with safety standards and task performance through employee well-being. Milošević et al. (2025) also showed that organizational climate factors and satisfaction with safety contribute to occupational safety in a dynamic mining environment.

These findings have managerial implications: investment in safety should not be viewed solely as a compliance cost. Bautista-Bernal et al. (2024) demonstrated, through a longitudinal study, that a comprehensive safety culture can improve workplace safety and is associated with broader organizational outcomes. For mining organizations, a safe work environment helps employees maintain focus, reduces distractions caused by risk uncertainty, and increases their willingness to assist colleagues and contribute beyond their primary job requirements.

Discussion H4: The Mediating Role of Safety Culture

H4 is the main contribution of this study. The test results show that the indirect effect of AI-based sustainable human resource management on employee performance through safety culture is 0.261 and is significant. At the same time, the direct effect of X→Y also remains significant and has a positive trend. This pattern indicates the occurrence of complementary partial mediation, namely that AI-based sustainable human resource management improves employee performance through two complementary pathways. The first pathway is a direct influence through strengthening employee abilities, motivation, and opportunities, while the second pathway is an indirect influence through the formation of a safety culture. Descriptively, the indirect influence covers approximately 42.2% of the total influence.

These findings extend the findings of Jia and Hou (2024), who positioned employee engagement as a mediating variable, and Lu et al. (2023), who used employee resilience and engagement to explain the influence of sustainable human resource management on performance. In high-risk industries, psychological mechanisms remain important, but this study demonstrates that safety-oriented organizational mechanisms also make a substantial contribution. Thus , AI-based human resource management practices not only influence individual employee attitudes and behaviors but can also shape the social and managerial environments that determine how employees perform their jobs.

The mediating role of safety culture also aligns with the findings of Han and Li (2024), who demonstrated that safety climate can influence the mechanisms leading to occupational safety among mine workers. Although these research models differ, both emphasize that the safety context plays a crucial role in determining how individual and organizational resources translate into performance. Therefore, the novelty of this research lies not only in the use of artificial intelligence, but primarily in the integration of technology-enabled human resource management sustainability with safety culture as an organizational mechanism specific to the mining industry context in improving employee performance.

Theoretical and Managerial Implications

Theoretically, this study extends the Ability–Motivation–Opportunity theory by demonstrating that ability, motivation, and opportunity supported by artificial intelligence can produce organizational outcomes in the form of a safety culture before ultimately impacting employee performance. This study also extends the Job Demands and Resources Theory by positioning safety culture as an organizational resource formed through technology-based human resource management practices. The integration of these two perspectives helps explain that technology will create value if it can enhance individual capabilities while strengthening a safe work environment. These results align with the responsible artificial intelligence approach, which emphasizes the importance of alignment between technology, people, policies, and organizational governance (Bujold et al., 2024; Singhwal & Bansal, 2026).

From a managerial perspective, mining companies need to ensure that AI investments in human resource management functions are not solely directed at administrative efficiency. The systems used should support competency mapping, tailored learning to employee needs, workload and schedule analysis, feedback, risk reporting, and decision-making support that can help work proceed more safely and effectively. Safety leadership and the work environment, which are the dominant drivers of safety culture, demonstrate that technology cannot replace the role of leadership. Data and recommendations generated by AI still need to be translated into management actions, resource allocation, clear communication, and consistent decision-making.

Organizations also need to implement the principles of responsible artificial intelligence. The use of employee data should be limited to legitimate, transparent, proportionate, and accountable purposes. Decisions impacting career development, performance appraisals, and employee placement should remain under human oversight and judgment. This practice is crucial because the benefits of artificial intelligence can turn into distrust if employees perceive the system as an unfair or opaque oversight tool. With proper governance, artificial intelligence can serve as a supporting tool that helps leaders and employees make better decisions, rather than completely replacing human judgment.

CONCLUSION AND SUGGESTIONS

This study shows that AI-based sustainable human resource management has a positive and significant effect on employee performance and safety culture. Safety culture has also been shown to have a positive and significant effect on employee performance. The results of the indirect effect test indicate that safety culture partially and complementary mediates the relationship between AI-based sustainable human resource management and employee performance. Thus, the influence of technology in human resource management on performance in the mining industry occurs not only through improving employee capabilities, motivation, and opportunities, but also through the creation of a stronger work environment, communication, and safety leadership.

The research model was able to explain 37.8% of the variation in safety culture and 49.4% of the variation in employee performance. The pathway of influence of AI-based sustainable human resource management on safety culture was the strongest relationship in the model. In the second-level construct of AI-based sustainable human resource management, the opportunity dimension had the largest relative contribution. Meanwhile, in the safety culture construct, safety leadership and the work environment showed significant contributions. These findings confirm that the successful digitization of human resource management in mining companies requires employee engagement, access to information, leadership support, and working conditions that enable data-driven decisions to be translated into safe and productive work behaviors.

The novelty of this research lies in its positioning of safety culture as an organizational mechanism that bridges the relationship between AI-based sustainable human resource management and employee performance in high-risk industries. This finding expands on previous research that primarily uses employee engagement, resilience, or safety performance as intermediary variables or outcomes. Practically, companies are advised to integrate AI systems with competency development, workforce planning, safety communication, risk information provision, and leadership decision-making support. Furthermore, the implementation of AI needs to be supported by transparent governance and maintain human oversight and final decision-making.

This study is limited by the relatively small number of respondents, 54, and the use of a cross-sectional design. Therefore, generalization of the results requires caution. Measurement based on respondents' perceptions can also introduce the possibility of common method bias. Therefore, future research is recommended to involve a broader sample of mining companies, use a longitudinal design, and combine employee self-assessments with supervisor assessments or objective performance data. Future research could also examine other variables, such as trust in artificial intelligence, perceptions of fairness, digital competence, psychological safety, employee well-being, and organizational resilience .

THANK-YOU NOTE

The author would like to thank the management and employees of PT. Jaya Nikel Pasific for their support and participation in this research. He also expresses his appreciation to the Management Study Program, Lamapápoleonro University, for their academic support in the research process and preparation of this article .

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