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PUBLIC PERCEPTION, ACCEPTANCE, AND EFFECTIVENESS OF AI IN INDUSTRIAL SAFETY PROGRAMS: ASSESSING TRUST, ETHICAL CONCERNS, AND IMPLEMENTATION CHALLENGES

By

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ABSTRACT

This study examined public perception, acceptance, and effectiveness of artificial intelligence (AI) in industrial safety programs, with emphasis on trust, ethical concerns, and implementation challenges. A descriptive survey design was used to collect data from 72 respondents across the Nigerian Ports Authority (NPA) and Chevron Nigeria Limited (CNL). Findings showed that respondents generally perceived AI as beneficial to industrial safety: 76.4% agreed that AI improves workplace safety and reduces accidents, while 79.2% supported wider adoption of AI-based safety measures. Acceptance was influenced mainly by management support and policy implementation (83.3%), cost of implementation (80.6%), worker resistance (77.8%), and trust in AI decision-making (73.6%). AI was rated highly effective for hazard detection (75.0%), emergency response (72.2%), and compliance with safety regulations (69.4%). However, concerns about lack of human oversight, job displacement, data privacy, surveillance, technical expertise, and regulatory constraints limited trust and adoption. The study concludes that AI can strengthen industrial safety compliance and accident prevention when supported by transparent governance, employee training, ethical safeguards, and cost-effective implementation strategies.

Keywords: Artificial Intelligence, industrial safety, public perception, trust, ethical concerns, implementation challenges.

1.0 Introduction

Industrial safety programs are designed to protect workers, equipment, and the environment from potential hazards in workplaces. These programs involve policies, procedures, and technologies aimed at reducing risks associated with industrial activities (Cebulla *et al.*, 2023). Workplace hazards include mechanical injuries, chemical exposures, falls, and fire incidents, making safety programs essential for preventing accidents and ensuring compliance with legal regulations (Johnson *et al.*, 2021). The introduction of advanced technologies, particularly artificial intelligence (AI), has significantly improved industrial safety measures. AI-driven systems provide real-time hazard detection, predictive risk assessment, and automated emergency responses, reducing human error and enhancing workplace safety (Yazdi *et al.*, 2024). AI refers to machine-based systems capable of performing tasks that typically require human intelligence, such as pattern recognition, decision-making, and automation (Li *et al.*, 2020). In industrial safety, AI applications include machine learning algorithms for risk analysis, computer vision for hazard detection, and robotic automation for dangerous tasks (Raparthi, 2021). AI improves workplace safety through real-time hazard identification and predictive analytics. For example, AI-powered surveillance systems monitor workers' movements and detect unsafe behaviors, sending alerts to prevent accidents (Ahmad *et al.*, 2024).

Additionally, AI enhances risk assessment by analyzing historical safety data to predict potential hazards before they occur, allowing proactive interventions (Yazdi *et al.*, 2021). AI-based automation also reduces workers' exposure to dangerous environments by performing high-risk tasks, such as handling toxic chemicals or operating heavy machinery (Kulal *et al.*, 2024). Despite these advancements, industries face challenges in fully integrating AI-driven safety measures, particularly concerning employee trust and acceptance, which influence its overall effectiveness. The adoption of AI in industrial safety programs depends largely on public perception and acceptance. While some workers and employers view AI as a tool that enhances safety and efficiency, others perceive it as a threat to job security or an invasion of privacy (Hyesun *et al.*, 2022). Employees may fear that AI-driven monitoring systems could be used to track their productivity rather than their safety, leading to distrust in AI applications (Afroogh *et al.*, 2024). Moreover, industries with a strong safety culture are more likely to accept AI-driven safety programs, while sectors with limited exposure to AI may resist adoption due to concerns about reliability and control (Khogali & Mekid, 2024). Organizations that involve employees in AI

implementation processes and provide training on AI functionalities tend to experience higher levels of acceptance (Bankins & Formosa, 2023).

The perception of AI also varies across geographical regions. In Africa, for example, AI adoption in safety programs is often hindered by limited technological infrastructure and regulatory uncertainties, whereas developed nations have a more structured approach to AI integration (Ameen *et al.*, 2021). AI-powered safety programs often rely on surveillance cameras, biometric systems, and wearable sensors to monitor workplace conditions. However, workers may feel uncomfortable with constant surveillance, fearing that their personal data may be misused or that AI may invade their privacy (Afroogh *et al.*, 2024). Another concern is data security, as AI systems require large amounts of sensitive information for accurate predictions. If not properly secured, these datasets could be vulnerable to cyberattacks or unauthorized access, raising questions about data protection and ethical AI use in workplaces (Hyesun *et al.*, 2022). Organizations must establish clear policies on data handling, storage, and access control to address these concerns (Khogali & Mekid, 2024). Additionally, AI decision-making in safety programs may be biased due to incomplete or skewed datasets, leading to unfair treatment of certain worker groups. For instance, AI may inaccurately assess risks for minority workers if it has not been trained on diverse datasets, further amplifying ethical challenges in AI deployment (Bankins & Formosa, 2023).

However, AI has proven to be highly effective in reducing workplace accidents and enhancing emergency response strategies. By using predictive analytics, AI identifies potential hazards before they lead to accidents, allowing companies to implement preventive measures (Yazdi *et al.*, 2024). AI-powered wearable devices can detect abnormal worker movements, fatigue, or exposure to hazardous conditions, automatically triggering alerts to prevent accidents (Ameen *et al.*, 2021). AI also improves emergency response times by automating crisis management protocols. For example, AI-based fire detection systems use thermal imaging and real-time analytics to identify fire outbreaks faster than traditional sensors, enabling quicker evacuations (Raparthi, 2021). Additionally, AI-driven robots can be deployed to dangerous zones during emergencies, reducing the risk to human responders (Ahmad *et al.*, 2024). Several industries have reported improvements in workplace safety through AI implementation. In manufacturing, AI-powered robotics have replaced human workers in high-risk operations such as metal cutting and toxic material handling, significantly reducing workplace injuries (Johnson *et al.*, 2021). In the construction sector, AI-driven drones inspect work sites for structural weaknesses, preventing accidents caused by faulty

infrastructure (Li *et al.*, 2020). Despite these advantages, AI-driven safety programs are not without limitations. Some AI systems require continuous updates to remain effective, and organizations may struggle with the costs associated with maintenance and AI training for employees (Kulal *et al.*, 2024). Furthermore, over-reliance on AI may lead to reduced human oversight, potentially causing safety lapses in cases where AI fails to recognize hazards (Cebulla *et al.*, 2023).

Problem Statement

The integration of AI in industrial safety programs has introduced advanced solutions for accident prevention, hazard detection, and emergency response. However, public perception and acceptance of AI in workplace safety remain mixed, with concerns surrounding job security, privacy, and trust influencing adoption rates. Ethical challenges, including data privacy and AI bias, further complicate AI implementation in safety programs. In recent years, Artificial Intelligence (AI) has been introduced as a solution to improve workplace safety by enhancing hazard identification, predictive risk assessments, and real-time monitoring. However, the adoption of AI in industrial safety programs has been met with skepticism, distrust, and ethical concerns. A major obstacle emerges from the way people perceive and welcome safety systems powered by artificial intelligence. Workers face job loss anxiety and employers doubt AI's reliability along with concerns about privacy and monitoring ethics. Additionally, AI effectiveness in reducing workplace hazards remains under scrutiny, as some organizations struggle with integration, high costs, and regulatory constraints. Despite efforts to promote AI adoption in safety programs, resistance from industries and employees persists.

Various studies have explored AI applications in workplace safety, yet there is limited research on how public perception and ethical concerns influence AI adoption in industrial safety programs. Existing literature has primarily focused on AI's technical effectiveness rather than human acceptance and ethical implications. Hence, it is therefore imperative to examine the trust, ethical concerns, and implementation challenges affecting AI adoption in industrial safety programs. The specific objectives of the study are:

- To examine public perception of AI in industrial safety programs;
- To evaluate the level of acceptance of AI-driven safety measures;
- To analyze the effectiveness of AI in reducing workplace hazards;
- To explore trust issues associated with AI in industrial safety;

- To identify ethical concerns in AI-driven industrial safety programs;
- To assess the challenges faced in implementing AI-based safety measures;
- To evaluate the role of AI in improving compliance with safety regulations.

Research Questions

This following research questions were raised to guide the study.

i. How do workers, employers, and the general public perceive AI in industrial safety programs?

ii. What factors influence the level of acceptance of AI-driven safety measures in industrial workplaces?

iii. How effective is AI in reducing workplace hazards, preventing accidents, and improving overall safety performance?

iv. What are the key trust issues associated with AI adoption in industrial safety programs?

v. What ethical concerns arise from the use of AI in workplace safety, particularly regarding privacy, bias, and surveillance?

vi. What are the major challenges industries face in implementing AI-based safety measures?

vii. How does AI contribute to improving compliance with industrial safety regulations and policies?

Khogali and Mekid (2024) explored the perception and ethical challenges of AI among newly graduated engineers. Their study examines how these engineers perceive AI's impact on trust and ethical considerations. Data-driven insights contribute to informed discussions, educational initiatives, and policy decisions aimed at addressing non-scientific concerns about AI. Through a survey of 715 engineers from diverse fields who frequently use information technologies, the study found that many perceived AI-related challenges as scientifically uncertain. The analysis indicates that fields heavily involved in critical decision-making show lower concerns about job displacement due to AI ($R^2 = 0.1121$). These findings suggest an optimistic outlook on AI advancements, reinforcing confidence and acceptance across industries.

Hyesun *et al.* (2022) examined the relationship between trust and ethics in AI, identifying two key dimensions—human-like trust and functionality trust. The study presents a multilevel framework where dispositional, institutional, and experiential trust influence trust in AI. Additionally, it assesses the relationship between trust in AI and seven ethical requirements outlined by the European Commission's High-Level Expert Group. The results indicate that societal and environmental well-being is positively linked to human-like trust, while accountability and

technical robustness are significantly associated with functionality trust. Notably, trust in AI surpassed trust in other institutions. The study offers a multidimensional trust framework inspired by ethical values to promote AI as a trustworthy technology.

Afroogh *et al.* (2024) systematically reviewed trust in human-machine interactions and its influence on AI acceptance across various domains. The study proposes a taxonomy of technical (safety, accuracy, robustness) and non-technical (ethical, legal, and mixed) trustworthiness metrics, along with trust-building and trust-breaking factors. The increasing presence of AI in daily life raises concerns about autonomy, dignity, and decision-making influence. Trust and distrust in AI significantly shape its adoption rate. The study suggests future research directions and strategies to enhance trustworthy AI, highlighting that trust fosters adoption, while distrust hinders it.

Kulal *et al.* (2024) examined the impact of AI adoption on public service efficiency in India, addressing an underexplored area in the literature. Using a comparative analysis, the study evaluates AI's role in improving municipal services and citizen-centric governance. Findings show notable efficiency gains, though human-centric impacts remain moderate. Infrastructure readiness is identified as a key factor, with only 25% of organizations possessing advanced AI capabilities. The study highlights AI's potential to enhance transparency, reduce corruption risks, and improve public service delivery, offering insights for policymakers on fostering effective AI implementation through improved policies and infrastructure.

Bankins and Formosa (2023) examined the effects of AI deployment across three approaches—task replacement, human-machine collaboration, and skill amplification—on five dimensions of meaningful work. Their study contextualizes meaningful work within the AI era, extends ethical AI discussions into workplace settings, and explores practical implications for future research. As AI adoption grows in workplaces, its influence on human work remains underexplored, particularly regarding whether it enhances or diminishes work meaning. The study highlights that AI's organizational deployment may either support or challenge opportunities for meaningful work, raising ethical considerations that require further examination.

Shevtsova *et al.* (2024) investigated trust and acceptance of AI-powered medical technologies, using a mixed-methods approach. A rapid review identified 110 trust-related and 77 acceptance-related factors, categorized into four main areas: human-related, technology-related, ethical/legal, and additional factors. A survey of 22 stakeholders—including researchers, policymakers, and hospital staff—showed that 84% of the 19 umbrella factors were highly relevant to AI trust and

acceptance. Factors such as gender, age, and education had lower relevance. The study's findings provide valuable insights for AI implementers in healthcare, helping them develop strategies to enhance trust and acceptance of AI-driven medical technologies.

Natalia *et al.* (2023) explored the foundations of trustworthy AI, analyzing principles, ethics, regulations, and system responsibility. Their study presents a multidimensional approach to AI governance, covering global ethical principles, risk-based regulation, and practical implementation of responsible AI systems. It emphasizes seven core requirements—human oversight, robustness, transparency, privacy, fairness, societal well-being, and accountability—offering guidance on their application. The research highlights the necessity of regulatory frameworks, such as auditing mechanisms and regulatory sandboxes, to ensure responsible AI. It concludes that regulation is crucial for balancing divergent perspectives on AI and achieving consensus on ethical AI development.

El-Helaly (2024) explored AI's impact on occupational health and safety, discussing its benefits and challenges in workplace environments. AI applications, such as wearable sensors, enable continuous health and safety monitoring, reducing workplace risks. However, concerns related to ethics, data privacy, and surveillance must be addressed. To maximize AI's advantages while mitigating its drawbacks, the study suggests training programs for employers and employees and the establishment of policies regulating AI integration in workplaces. These measures aim to ensure a balanced approach to AI-driven occupational health and safety improvements.

2.0 MATERIALS AND METHODS

This study employed a descriptive survey research design to assess public perception, acceptance, and the effectiveness of AI-driven maritime industrial safety programs in Nigeria. The study focused on two major maritime industries in Nigeria: Nigerian Ports Authority (NPA) and Chevron Nigeria Limited (CNL). The NPA is responsible for port administration, maritime security, and cargo handling, making it a critical stakeholder in maritime safety. CNL, a leading oil and gas company with offshore operations, integrates advanced safety measures in its maritime activities, making it a suitable industry for assessing AI applications in industrial safety. A structured self-designed questionnaire was used as the research instrument to collect primary data. The questionnaire was developed based on an extensive review of maritime safety literature, ensuring strong content validity. The target population included maritime employees across different operational levels in NPA and CNL. A simple random sampling technique was used to select 80

respondents from both industries, consisting of 40 from NPA and 40 from CNL. The sample included engineers, safety officers, operational managers, and seafarers directly involved in maritime safety programs. Out of the 80 questionnaires distributed, 72 were completed and deemed usable for analysis. Data were analyzed using descriptive and inferential statistics, including frequency distribution and percentages; charts and inferential statistics of multiple regression.

Ethical clearance was obtained from the relevant institutional ethics committee before data collection. Participation was voluntary, and informed consent was obtained from all respondents after they were briefed on the study purpose, confidentiality of responses, and their right to withdraw at any stage without penalty.

The questionnaire was assessed for internal consistency using Cronbach's alpha. The instrument yielded an overall Cronbach's alpha value of 0.82, indicating high reliability for the constructs measured in the study.

3.0 RESULTS AND DISCUSSION

Research Question 1: How do workers, employers, and the general public perceive AI in industrial safety programs?

Table 1: Perception of AI in Industrial Safety Programs

Perception Items	**Yes (%)**	**No (%)**
AI improves workplace safety and reduces accidents.	55 (76.4%)	17 (23.6%)
AI increases efficiency in detecting and responding to hazards.	50 (69.4%)	22 (30.6%)
AI reduces the need for human supervision in industrial safety programs.	38 (52.8%)	34 (47.2%)
AI may lead to job displacement in the industrial sector.	48 (66.7%)	24 (33.3%)
AI raises privacy concerns regarding employee monitoring.	42 (58.3%)	30 (41.7%)

Workers and employers trust AI-driven safety systems.	46 (63.9%)	26 (36.1%)
AI-based safety measures should be widely adopted in the industry.	57 (79.2%)	15 (20.8%)

Table 1 shows the perception of AI in industrial safety programs and the result showed that majority of respondents (76.4%) agree that AI improves workplace safety and reduces accidents, while 69.4% believe it enhances hazard detection and response. Additionally, 79.2% support the widespread adoption of AI-based safety measures. While AI is perceived positively in safety management, 66.7% of respondents express concerns about job displacement, and 58.3% highlight privacy issues due to AI monitoring. 63.9% of respondents believe workers and employers trust AI-driven safety systems.

Hence, the perception of workers, employers and general public showed that AI is generally seen as beneficial for industrial safety.

Research Question 2: What factors influence the level of acceptance of AI-driven safety measures in industrial workplaces?

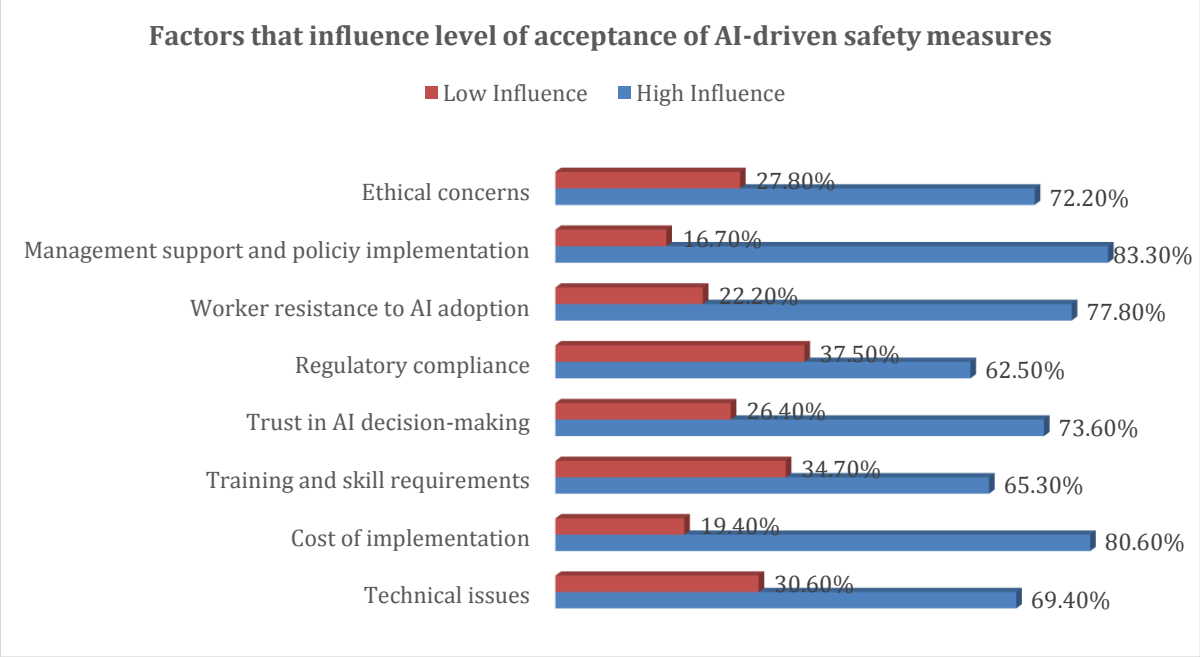


Figure 1: Factors that influence level of acceptance of AI-driven safety measures

Figure 1 shows the factors that influence level of acceptance of AI-driven safety measures in industrial workplaces and result showed that the highest influencing factors in AI acceptance include management support and policy implementation (83.3%), cost of implementation (80.6%), and worker resistance to AI adoption (77.8%). Trust in AI decision-making (73.6%) and ethical concerns (72.2%) also significantly influence acceptance. While regulatory compliance (62.5%) and training needs (65.3%) are influencing factors, they appear less critical compared to cost and management support.

Hence, the major factors that influence level of acceptance of AI-driven safety measures in industrial workplaces are management support and policy implementation, cost of implementation, worker resistance to AI adoption and trust in AI decision-making.

Research Question 3: How effective is AI in reducing workplace hazards, preventing accidents, and improving overall safety performance?

Table 2: AI Effectiveness in Workplace Safety

Effectiveness Items	**Highly Effective (HE) (%)**	**Moderately Effective (ME) (%)**	**Not Effective (NE) (%)**
AI improves hazard detection and risk assessment	54 (75.0%)	15 (20.8%)	3 (4.2%)
AI enhances real-time monitoring of workplace safety conditions	50 (69.4%)	18 (25.0%)	4 (5.6%)
AI reduces human error in safety decision-making	48 (66.7%)	20 (27.8%)	4 (5.6%)
AI improves emergency response and accident prevention	52 (72.2%)	16 (22.2%)	4 (5.6%)
AI reduces the frequency of workplace injuries and fatalities	46 (63.9%)	22 (30.6%)	4 (5.6%)
AI-driven predictive analytics improve maintenance and equipment safety	49 (68.1%)	18 (25.0%)	5 (6.9%)
AI-based safety training enhances workers' preparedness	44 (61.1%)	23 (31.9%)	5 (6.9%)

AI helps industries comply with safety regulations more effectively	50 (69.4%)	19 (26.4%)	3 (4.2%)

Table 2 shows the AI effectiveness in workplace safety and result showed that AI is perceived as highly effective in hazard detection (75.0%), emergency response (72.2%), and compliance with safety regulations (69.4%). AI-based safety training (31.9%) and predictive maintenance (25.0%) show moderate effectiveness. Very few respondents (ranging from 4.2% to 6.9%) believe AI is not effective.

Hence, AI significantly enhances workplace safety by reducing hazards, minimizing accidents, and ensuring regulatory compliance.

Research Question 4: What are the key trust issues associated with AI adoption in industrial safety programs?

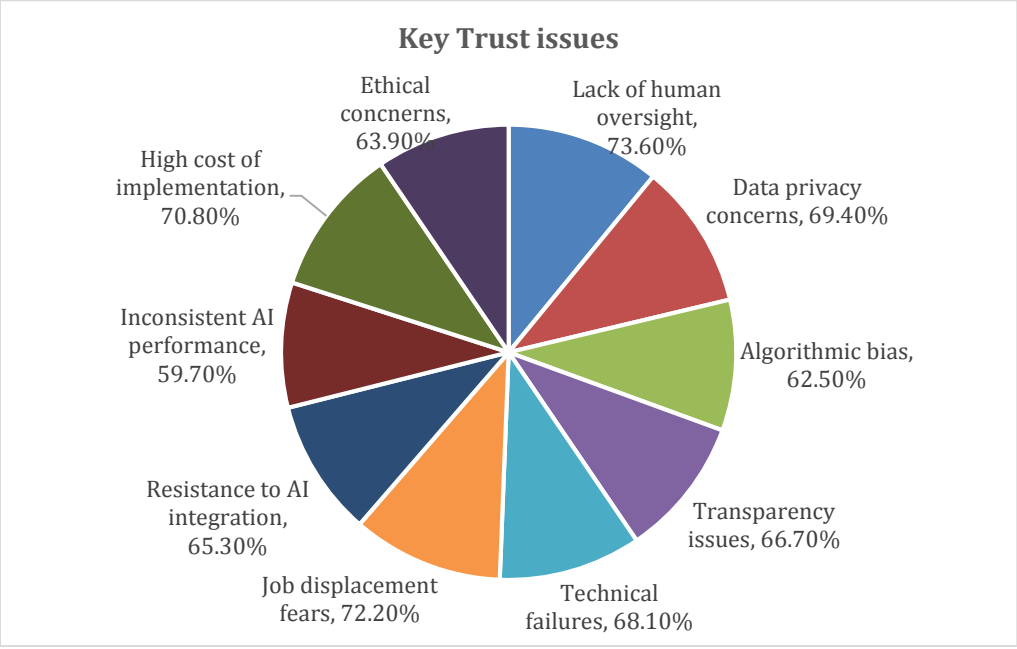


Figure 2: Key trust issues associated with AI adoption

Figure 2 shows the key trust issues associated with AI adoption in industrial safety programs and result showed that lack of human oversight (73.6%), job displacement fears (72.2%), and high cost of implementation (70.8%) are the most issues affecting trust in AI safety programs. Data privacy concerns (69.4%) and algorithmic bias (62.5%) indicate that ethical considerations remain a critical barrier to AI trust. Technical failures (68.1%), transparency issues (66.7%), and inconsistent AI performance (59.7%) indicate that AI systems need to be more predictable and explainable for widespread acceptance.

Hence, the major trust issues associated with AI adoption in industrial safety programs are lack of human oversight, job displacement fears and high cost of implementation.

Research Question 5: What ethical concerns arise from the use of AI in workplace safety, particularly regarding privacy, bias, and surveillance?

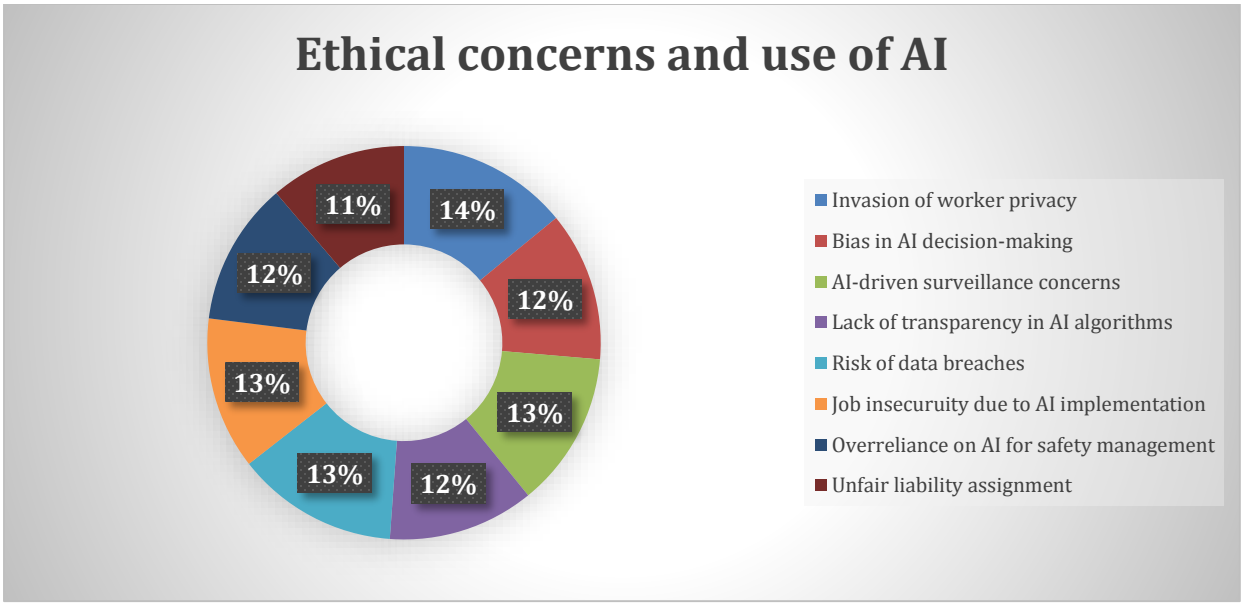


Figure 3: Ethical concerns that arise from the use of AI in workplace safety

Ethical concerns in AI-driven workplace safety: Invasion of worker privacy (76.4%), risk of data breaches (72.2%), and AI-driven surveillance concerns (69.4%) were the leading ethical concerns. Other concerns included job insecurity due to AI implementation (68.1%), bias in AI decision-making (66.7%), lack of transparency (65.3%), overreliance on AI (63.9%), and unfair liability assignment (61.1%).

Research Question 6: What are the major challenges industries face in implementing AI-based safety measures?

Table 3: Challenges in Implementing AI-Based Safety Measures

Challenges	Frequency (%)
High cost of AI adoption	58 (80.6%)
Lack of technical expertise	53 (73.6%)
Resistance from employees	50 (69.4%)
Integration with existing systems	47 (65.3%)
Data privacy and security concerns	49 (68.1%)
Reliability of AI systems	45 (62.5%)
Regulatory and compliance issues	51 (70.8%)
Ethical concerns	46 (63.9%)

Implementation challenges**:** The main challenges in implementing AI-based safety measures were high cost of AI adoption (80.6%), lack of technical expertise (73.6%), regulatory and compliance issues (70.8%), employee resistance (69.4%), data privacy and security concerns (68.1%), integration with existing systems (65.3%), ethical concerns (63.9%), and reliability of AI systems (62.5%). These findings indicate that financial, technical, regulatory, and ethical barriers must be addressed before AI can be widely adopted in industrial safety programs.

Research Question 7: How does AI contribute to improving compliance with industrial safety regulations and policies?

Table 4: Model Summary and Multiple Regression Analysis for RQ 7

Model	R	R^2	Adjusted R^2	Std. Error of the Estimate	Standardized Beta (β)	t	Sig.
1	0.632a	0.399	0.392	0.685	0.632	6.82	0.000

Result in Table 4 shows the model summary of the simple linear regression analysis examining the contribution of AI implementation to compliance with industrial safety regulations and policies. The result shows a correlation coefficient (R) of 0.632, indicating a moderate positive

relationship between AI implementation and industrial safety compliance. The coefficient of determination ($R^2 = 0.399$) indicates that AI implementation accounted for 39.9% of the variation in industrial safety compliance. The adjusted R^2 value of 0.392 suggests that the model remained stable after adjusting for sample size. The standard error of the estimate was 0.685, while the significance value ($p = 0.000$) indicates that the regression model was statistically significant at the 0.05 level. This implies that AI implementation significantly predicts compliance with industrial safety regulations and policies. The result presents the regression coefficient for the predictor variable. The standardized regression coefficient ($\beta = 0.632$) indicates that AI implementation had a moderate positive effect on industrial safety compliance. The corresponding t-value of 6.82 further confirms that the effect was statistically significant ($t = 6.82$, $p = 0.000$). This finding indicates that increased implementation of AI technologies significantly improves compliance with industrial safety regulations and policies.

Discussion of Findings

The study showed that the perception of workers, employers and general public showed that AI is generally seen as beneficial for industrial safety. This finding aligns with the study of Yazdi *et al.*, (2024), who asserted that AI significantly enhances industrial safety through real-time hazard detection and predictive analytics, reducing human error and improving workplace security. Similarly, Ahmad *et al.* (2024) highlighted how AI-powered surveillance systems monitor worker behavior and detect unsafe practices, leading to accident prevention and increased trust in AI safety measures. Furthermore, Cebulla *et al.* (2023) emphasized that AI-driven safety programs provide automated emergency responses and compliance tracking, ensuring adherence to safety regulations and fostering positive perceptions of AI among stakeholders.

The study showed that the major factors that influence level of acceptance of AI-driven safety measures in industrial workplaces are management support and policy implementation, cost of implementation, worker resistance to AI adoption and trust in AI decision-making. This finding aligns with the study of Bankins and Formosa (2023), who asserted that organizations with strong management support and clear AI policies tend to experience higher levels of AI acceptance, as employees feel more engaged in the transition process. Likewise, Khogali and Mekid (2024) found that industries with limited exposure to AI often resist its adoption due to concerns about cost and workforce displacement. Additionally, Hyesun *et al.* (2022) noted that trust in AI decision-making

is a critical factor in its adoption, as employees often fear that AI monitoring may prioritize productivity tracking over workplace safety.

The study showed that AI significantly enhances workplace safety by reducing hazards, minimizing accidents, and ensuring regulatory compliance. This finding is consistent with the study of Yazdi *et al.* (2021), who asserted that AI-powered predictive analytics identify potential hazards before accidents occur, allowing industries to implement preventive measures and enhance overall workplace safety. Similarly, Ameen *et al.* (2021) highlighted how AI-based wearable devices detect worker fatigue, abnormal movements, and exposure to hazardous conditions, automatically triggering safety alerts. Moreover, Johnson *et al.* (2021) found that AI integration in industrial environments has led to substantial improvements in compliance with safety regulations, particularly through automated safety audits and real-time monitoring.

The study revealed that the major trust issues associated with AI adoption in industrial safety programs are lack of human oversight, job displacement fears and high cost of implementation. This finding aligns with the study of Afroogh *et al.* (2024), who asserted that employees often distrust AI-driven safety programs due to fears that these systems may prioritize efficiency over human judgment, leading to concerns about reduced human oversight. Likewise, Ameen *et al.* (2021) highlighted that job displacement remains a critical issue, as AI automation increasingly replaces human workers in safety-related roles, fostering resistance to AI adoption. Furthermore, Kulal *et al.* (2024) found that the high cost of implementing AI-driven safety systems serves as a significant barrier, particularly for industries with limited financial resources, which may struggle with continuous AI updates and workforce training.

The study revealed that the major ethical concerns that arise from the use of AI in workplace safety are invasion of worker privacy, risk of data breaches and AI-driven surveillance concerns. This finding aligns with the study of Afroogh *et al.* (2024), who asserted that AI's growing presence in workplace safety raises ethical concerns about autonomy, dignity, and decision-making influence, leading to distrust among employees. Similarly, Natalia *et al.* (2023) highlighted that privacy and data protection are critical components of trustworthy AI, emphasizing the need for regulatory frameworks to prevent misuse of employee data. Additionally, El-Helaly (2024) found that while AI improves occupational health and safety, it also introduces ethical challenges such as excessive surveillance, requiring policies to ensure that AI is used responsibly.

The study revealed that the major challenges industries face in implementing AI-based safety measures are high cost of AI adoption, lack of technical expertise, regulatory and compliance issues. This finding aligns with the study of Kulal *et al.* (2024), who asserted that AI implementation in industries is often hindered by financial constraints and infrastructure readiness, with only 25% of organizations possessing advanced AI capabilities. Similarly, Bankins and Formosa (2023) noted that companies struggle with the integration of AI due to the need for specialized workforce training, as many employees lack the technical expertise required to operate AI-driven systems. Furthermore, Natalia *et al.* (2023) stated that regulatory challenges are a significant barrier, as industries must navigate complex compliance requirements to align AI safety measures with legal standards.

The study revealed that AI contributes significantly to improving compliance with industrial safety regulations and policies by enhancing real-time monitoring, predictive analytics, and automation of safety procedures. This finding aligns with the study of Shevtsova *et al.* (2024), who asserted that AI's ability to monitor workplace conditions in real-time leads to higher compliance with safety regulations, reducing the likelihood of legal violations. Similarly, Hyesun *et al.* (2022) highlighted that AI-driven predictive analytics provide industries with actionable insights, enabling them to meet regulatory standards more effectively. Additionally, El-Helaly (2024) found that AI automation streamlines safety procedures by reducing human error, ensuring consistent enforcement of workplace policies.

4.0 CONCLUSION

The study highlights that AI is generally perceived as beneficial for industrial safety, with workers, employers, and the general public recognizing its role in hazard detection, accident prevention, and regulatory compliance. However, the level of acceptance of AI-driven safety measures depends on key factors such as management support, cost of implementation, worker resistance, and trust in AI decision-making. While AI significantly enhances workplace safety, concerns related to trust and ethics remain critical challenges. The major trust issues include a lack of human oversight, job displacement fears, and high implementation costs, while ethical concerns revolve around worker privacy, data security, and AI-driven surveillance. Additionally, industries face practical barriers to AI adoption, such as financial constraints, lack of technical expertise, and complex regulatory requirements. Despite these challenges, AI plays a significant role in ensuring compliance with industrial safety regulations by enabling real-time monitoring, predictive

analytics, and automation of safety procedures. To maximize the benefits of AI in industrial safety, it is essential to address these challenges through improved policies, workforce training, transparent AI governance, and cost-effective implementation strategies. By fostering trust and ethical AI practices, industries can achieve safer workplaces and higher compliance with safety regulations. The following recommendations are suggested:

Limitations of the Study: This study was limited by its relatively small sample size of 72 respondents drawn from two organizations, which may restrict the generalizability of the findings to all industrial sectors. The cross-sectional design also captured respondents' perceptions at one point in time and therefore could not determine changes in acceptance, trust, or effectiveness of AI-driven safety programs over time.

(i) Government and policymakers should develop clear guidelines and regulations for AI adoption in industrial safety, ensuring strong management support and policy implementation across industries.

(ii) Industries and organizations should invest in cost-effective AI solutions by exploring government incentives, public-private partnerships, and scalable AI technologies to reduce the financial burden of implementation.

(iii) Employers and human resource departments should address worker resistance by organizing awareness programs, participatory AI implementation processes, and workforce training, ensuring employees understand the benefits of AI-driven safety measures.

(iv) Technology developers and industry leaders should ensure human oversight in AI-driven safety programs by designing systems that integrate both automation and human decision-making, improving trust and accountability.

(v) Regulatory agencies and cybersecurity experts should strengthen data privacy and security measures by implementing robust cybersecurity protocols, strict data access controls, and transparent AI surveillance policies to protect workers' personal information.

(vi) Educational institutions and professional training centers should increase technical expertise by offering specialized AI training programs, certifications, and workshops to equip workers with the necessary skills to operate AI-driven safety systems.

(vii) Government and industry regulators should simplify regulatory and compliance processes by developing industry-specific AI policies that align with safety standards, ensuring a smoother integration of AI technologies.

(viii) Industrial safety managers and AI specialists should encourage the use of predictive analytics by integrating AI-driven hazard detection and risk assessment tools, enhancing real-time monitoring and reducing workplace accidents.

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REFERENCES

Afroogh, S., Akbari, A., Malone, E., Kargar, M., & Alambeigi, H. (2024). Trust in AI: Progress, challenges, and future directions. *Humanities and Social Sciences Communications, 11*(1), 1–30. https://doi.org/10.1057/s41599-024-04044-8

Ahmad, K., Iqbal, W., El-Hassan, A., Qadir, J., Benhaddou, D., Ayyash, M., & Al-Fuqaha, A. (2024). Data-driven artificial intelligence in education: A comprehensive review. *IEEE Transactions on Learning Technologies, 17,* 12–31. https://doi.org/10.1109/TLT.2023.3314610

Ameen, N., Hosany, S., & Tarhini, A. (2021). Consumer interaction with cutting-edge technologies: Implications for future research. *Computers in Human Behavior, 120,* Article 106761. https://doi.org/10.1016/j.chb.2021.106761

Bankins, S., & Formosa, P. (2023). The ethical implications of artificial intelligence (AI) for meaningful work. *Journal of Business Ethics, 185*(4), 725–740. https://doi.org/10.1007/s10551-023-05339-7

Cebulla, A., Szpak, Z., & Knight, G. (2023). Preparing to work with artificial intelligence: Assessing WHS when using AI in the workplace. *International Journal of Workplace Health Management, 16*(4), 294–312. https://doi.org/10.1108/IJWHM-09-2022-0141

El-Helaly, M. (2024). Artificial intelligence and occupational health and safety: Benefits and drawbacks. *La Medicina del Lavoro, 115*(2), e2024014. https://doi.org/10.23749/mdl.v115i2.15835

Choung, H., David, P., & Ross, A. (2023). Trust and ethics in AI. *AI & Society*, *38*(2), 733–745. https://doi.org/10.1007/s00146-022-01473-*4*

Johnson, M., Jain, R., Brennan-Tonetta, P., Swartz, E., Silver, D., Paolini, J., Mamonov, S., & Hill, C. (2021). Impact of big data and artificial intelligence on industry: Developing a workforce roadmap for a data-driven economy. *Global Journal of Flexible Systems Management, 22*(3), 197–217. https://doi.org/10.1007/s40171-021-00272-y

Khogali, H. O., & Mekid, S. (2024). Perception and ethical challenges for the future of AI as encountered by surveyed new engineers. *Societies, 14*(12), Article 271. https://doi.org/10.3390/soc14120271

Kulal, A., Rahiman, H. U., Suvarna, H., Abhishek, N., & Dinesh, S. (2024). Enhancing public service delivery efficiency: Exploring the impact of AI. *Journal of Open Innovation: Technology, Market, and Complexity, 10*(3), Article 100329. https://doi.org/10.1016/j.joitmc.2024.100329

Li, X. H., Cao, C. C., Shi, Y., Bai, W., Gao, H., Qiu, L., Wang, C., Gao, Y., Zhang, S., Xue, X., & Chen, L. (2022). A survey of data-driven and knowledge-aware explainable AI. *IEEE Transactions on Knowledge and Data Engineering, 34*(1), 29–49. https://doi.org/10.1109/TKDE.2020.2983930

Díaz-Rodríguez, N., Del Ser, J., Coeckelbergh, M., López de Prado, M., Herrera-Viedma, E., & Herrera, F. (2023). Connecting the dots in trustworthy artificial intelligence: From AI principles, ethics, and key requirements to responsible AI systems and regulation. *Information Fusion, 99*, Article 101896. https://doi.org/10.1016/j.inffus.2023.101896

Raparthi, M., Gayam, S. R., Kasaraneni, B. P., Kondapaka, K. K., Pattyam, S. P., Putha, S., Kuna, S. S., Nimmagadda, V. S. P., Sahu, M. K., & Thuniki, P. (2021). AI-driven decision support systems for precision medicine: Examining the development and implementation of AI-driven decision support systems in precision medicine. *Journal of Artificial Intelligence & Research, 1*(1), 11–20.

Shevtsova, D., Ahmed, A., Boot, I. W. A., Sanges, C., Hudecek, M., Jacobs, J. J. L., Hort, S., & Vrijhoef, H. J. M. (2024). Trust in and acceptance of artificial intelligence applications in

medicine: Mixed methods study. *JMIR Human Factors, 11*, e47031. https://doi.org/10.2196/47031

Yazdi, M., Golilarz, N. A., Nedjati, A., & Adesina, K. A. (2021). An improved lasso regression model for evaluating the efficiency of intervention actions in a system reliability analysis. *Neural Computing and Applications, 33*(13), 7913–7928. https://doi.org/10.1007/s00521-020-05537-8

Yazdi, M., Zarei, E., Adumene, S., & Beheshti, A. (2024). Navigating the power of artificial intelligence in risk management: A comparative analysis. *Safety*, *10*(2), Article 42. https://doi.org/10.3390/safety10020042