

Influence of Artificial Intelligence Technology Integration on Occupational Health and Safety among workplaces in Nigeria

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Abstract

This paper explores how artificial intelligence can improve occupational health and safety service delivery in Nigerian workplaces. It frames OHS as a service function that supports prevention through hazard identification, training, and timely incident management. It notes systemic constraints such as weak documentation and reporting, limited enforcement capacity, gaps in awareness and professional skills, and extensive informal work. The discussion is situated within Nigeria's OHS framework, including the Factories Act, the National OSH Policy, the Employees' Compensation Act and NSITF coverage, and the Nigeria Data Protection Act 2023. Six AI capability areas were examined which are risk prediction, natural language processing of incident narratives, computer vision in high risk settings, wearables for exposure and fatigue monitoring, AI supported learning, and decision support for safety officers and clinics. It concludes that AI adoption should be phased and NDPA compliant, with investments in power, connectivity, data quality, and workforce skills to sustain safer, more productive operations. It was then recommended that AI should be deployed in OHS in Nigerian workplace to facilitate smooth service delivery and that all present and perceived constraints to the deployment of AI should be promptly addressed to forestall their negative impact on the deployment of AI.

Keywords: Artificial intelligence, occupational health and safety, risk management, workplace safety, service delivery

Introduction

The concept of occupational health and safety (OHS) is used to describe the ideal practices, policies and procedures designed to protect the health, safety and wellbeing of workers in any occupation. It involves the regulation and procedure intended to prevent accidents, injuries, illness or death in all workplaces or any public spaces (Abina et al., 2023). Occupational health and safety is often considered as a compliance requirement. However, in practice, it is a service function. It provides prevention, response, and recovery support to workers and management through risk assessments, controls, training, incident investigation, medical referral pathways, and continuous improvement. In Nigeria, this service role is difficult to deliver consistently because many workplaces operate with limited safety staffing, uneven documentation, and unreliable reporting channels (Otitolaiye & Abd-Aziz, 2025). The situation is further complicated by the structure of Nigeria's labour market, where informal employment dominates total employment. The National Bureau of Statistics (NBS) reported an informal employment rate of about 92.7 percent in the first quarter of 2024, reflecting the scale of work taking place outside formal systems that typically support structured safety management (NBS, 2024). Artificial intelligence (AI) offers a set of tools that can improve how OHS services are delivered. In the Nigerian workplace, the most useful AI applications are not futuristic robotics. They are systems that help people do core tasks better such as spotting hazards early, triaging incident reports faster, improving training retention, predicting high risk conditions, and reducing paperwork delays that lead to poor follow up (Babashahi, 2024; El-Helaly, 2024). In addition, AI can also support companies' regulators and insurers by improving data quality and enabling more consistent reporting and analysis which can translate into better occupational health service delivery (Ola-Oluwa, 2024). However, Nigeria's workplaces face constraints that affect AI adoption such as electricity and connectivity gaps, limited high quality data, and uneven digital skills (Yelwa et al., 2022). This therefore calls for an approach that emphasizes practical deployment, strong governance, and low friction integration with existing processes.

Legal and Institutional Context of Occupational Health and Safety in Nigeria

In order to provide an insight into how AI can impact optimum service delivery in the workplace through OHS, there is need to understand the legal and institutional landscape of OHS in Nigeria. This requires looking at current laws guiding OHS in Nigeria. these include the Factories Act, the National Policy on Occupational Safety and Health, the Employee Compensation Act, and the Nigeria Social Insurance Trust Fund (NSITF).

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The Factories Act and compliance expectations

Nigeria's Factories Act establishes a structured framework around factory regulation, including registration requirements and multiple provisions tied to health, safety, welfare, and accident notification (Dyregborg et al., 2022; Uchendu et al., 2023). The Act is explicitly arranged around registration of factories and related obligations, signaling the importance of formal oversight for industrial workplaces. While many Nigerian work settings are not factories in the strict sense, the Act remains a foundational reference point for industrial safety, especially in manufacturing and processing environments (Uchendu et al., 2023).

National Policy on Occupational Safety and Health

Nigeria's National Policy on Occupational Safety and Health sets a prevention-oriented approach, referencing Nigeria's ratification of International Labour Organization (ILO) Convention No. 155 in 1994 and linking worker safety to constitutional principles on safeguarding health, safety, and welfare in employment (Otteburn & Axel, 2025). The policy emphasises notification systems, annual statistics on occupational accidents and diseases, and the establishment of a national information management system linked to health information systems. This policy direction is important because AI systems perform best when they operate within consistent data channels and feedback loops (El-Helaly, 2024).

Employees' Compensation Act 2010 and the NSITF scheme

The Employees' Compensation Act (ECA) 2010 repeals the earlier Workmen's Compensation regime and provides for compensation relating to death, injury, disease, or disability arising from or in the course of employment (Umukoro, 2025). The Nigeria Social Insurance Trust Fund (NSITF) describes compensation coverage under the ECA as including injury, mental stress, occupational diseases, hearing impairment, injuries occurring outside the normal workplace during work, and fatal cases (Umukoro, 2025). From an AI integration perspective, the ECA is not just a legal framework. It creates an operational need for accurate incident capture, traceable evidence, and timely case management, all of which can be strengthened through well governed digital systems (Farber, 2025).

Data protection and workplace monitoring under Nigeria Data Protection Act

AI-enabled OHS often involves monitoring and inference. This involves the use of wearable sensors for heat stress, computer vision for personal protective equipment compliance, predictive analytics for near misses, or automated triage of incident narratives. These activities intersect directly with the Nigeria Data Protection Act (NDPA) of 2023 (FGN, 2023). The Act requires that data subjects be informed about key issues such as the purpose and retention period, and it specifically addressed automated decision-making, including profiling, and envisaged consequences and the right to object and challenge such processing. It also requires a data privacy impact assessment where processing is likely to result in high risk to rights and freedoms (FGN, 2023). This is essential for OHS because poorly governed safety monitoring can result in disciplinary actions, discrimination, or unfair performance management. In Nigeria, where trust in workplace processes can be fragile, administrative processes that aligns with the mandate of NDPA is essential for uptake and legitimacy.

The Need for Improved Service Delivery in Nigerian Occupational Health and Safety

Occupational Health and Safety is a critical aspect of any nation's workforce, ensuring the well-being and productivity of its labor force. In Nigeria, however, the delivery of OHS services faces significant challenges that necessitate urgent and comprehensive improvement. In many Nigerian organizations, OHS performance is evaluated mainly through audits and incident counts. But improvement in service delivery should be measured by whether safety services reach workers effectively and consistently. In Nigeria, the biggest service gaps typically include delayed incident response where incidents are reported late or not at all, especially for contractors and casual workers; weak reporting where fear of blame and job loss reduces reporting; limited supervisor capacity where supervisors are overloaded and safety checks become superficial; and informal work settings where large portions of work happen outside systems that support structured OHS management (National Bureau of Statistics, NBS, 2024). Another main issue plaguing Nigerian OHS is the lack of adequate enforcement of existing regulations. While the country possesses a legal framework for OHS, its implementation remains weak. This is due, in part, to insufficient resources allocated to regulatory bodies, leading to infrequent inspections and a lack of deterrents for non-compliance (Adebowale & Agumba, 2024). Consequently, many workplaces operate with substandard safety measures, exposing workers to preventable hazards. Furthermore, there is a significant gap in awareness and training regarding OHS best practices (Vitrano & Micheli, 2024; Mixafenti et al., 2025). Many employers, particularly in small and medium-sized enterprises (SMEs), lack the knowledge and resources to implement effective safety programs (Wu et al., 2025). This is compounded by a shortage of qualified OHS professionals and trainers, limiting the availability

Influence of Artificial Intelligence Technology Integration on Occupational Health and ... Olíkíabó, S. O. & Aídéyan, D. O. (2026) of relevant education and skill-building opportunities for both employers and employees (Elegbede & Akinbile, 2024). The result is a workforce that is often ill-equipped to identify and mitigate workplace risks. The consequences of these deficiencies are far-reaching. Workplace accidents and illnesses contribute to significant economic losses through lost productivity, healthcare costs, and compensation claims. Moreover, they have a profound human cost, leading to pain, suffering, and even death for affected workers and their families. A stronger OHS system is therefore essential not only for economic reasons but also for overall improvement in service delivery. Addressing these challenges requires a variety of approaches among which there is the application of AI. When AI is carefully implemented in the workplace, it can support service delivery by reducing friction and expand reach by increasing coverage and consistency of workers' services without compromising their jobs.

Application of Artificial Intelligence into Occupational Health and Safety in Nigeria

The application of AI to OHS in Nigeria is particularly relevant given the country's industrial landscape which is heavy on oil & gas, construction, and manufacturing, in addition to its specific challenges regarding regulatory enforcement (Dhali et al., 2023). In Nigeria, where human supervision resources can be stretched and manual compliance enforcement is often inconsistent, AI can provide advantage by offering constant monitoring and predictive capabilities that don't rely solely on physical inspections. For the purpose of optimum service delivery, the application of AI in workplace safety can be grouped into six practical capability areas as follows:

Risk prediction and prioritization: Machine learning models can use incident history, shift patterns, weather, production pressure indicators, and equipment maintenance logs to predict where injuries are more likely (Aminzadeh et al., 2025). In Nigeria, this is especially relevant where supervisors manage large teams and hazards change quickly due to improvisation, power fluctuations, or supply chain disruptions.

Natural language processing (NLP) for incident narratives: Many Nigerian incident reports, when they exist, are written as free text in simple English, Nigerian English, or a mix of English and local expressions (Decker, 2021; Oladipupo & Akinola, 2022). NLP tools can classify incidents, detect recurring root causes, and flag severe cases for immediate escalation (Khurram et al., 2025; Mohamed, 2025). This improves service delivery by shortening the time between report and action.

Computer vision for high-risk environments: Computer vision can detect PPE use, unsafe proximity to moving equipment, fall risks, blocked exits, and unsafe manual lifting postures (Liu et al., 2021). However, in Nigeria, the priority is often selective deployment of computer vision where risk is high and controls are hard to enforce consistently, such as construction sites, warehouses, and manufacturing lines (Liu et al., 2021; Alateeq., 2023). This can truncate the overall efficacy of computer vision in OHS thereby negatively affecting service delivery in the workplace.

Personal exposure monitoring and wearables: Wearables can track heat stress, fatigue proxies, noise exposure, or vibration (Moshawrab et al., 2022). This is important for Nigeria's hot climates, outdoor work, and generator-prone environments where fumes, noise, and heat interact.

AI supported learning and competence management: AI can personalize safety learning, test retention, and provide micro coaching (Sajja et al., 2024). In environments with multicultural work force, AI can help deliver short training in simplified English or translated versions, with voice-based support.

Decision support for safety officers and clinics: AI can support triage, referral, and follow up (Abdel-Hafez et al., 2023). Nigeria's health services vary widely by location, so decision support tools can standardize first response protocols and improve documentation.

Improving Service Delivery in Nigerian Workplace through Incorporation of AI into OHS In Nigeria, where many workplaces still rely on manual inspections, paper reports, and reactive responses after incidents which negatively impacts overall service delivery in these workplaces. One major way AI improves service delivery is by speeding up hazard detection and response. This can be done through risk prediction and prioritization, computer vision for high-risk environments, and personal exposure monitoring and wearables (Khurram et al., 2025; Kolivand et al., 2025). In factories, construction sites, warehouses, and oil and gas facilities, AI powered camera systems can flag unsafe conditions such as missing protective equipment, overcrowded work areas, blocked emergency exits, or unsafe proximity to machinery (Sanjeevani et al., 2024). When these issues are detected early, supervisors can respond before they cause injury. AI can also support quicker reporting by helping workers capture hazards through mobile apps that classify the risk, suggest the right category, and guide next steps (Shah & Mishra, 2024). This reduces delays that often happen when staff are unsure

Influence of Artificial Intelligence Technology Integration on Occupational Health and ... Olíkiabo, S. O. & Aídéyan, D. O. (2026) of what to report or how to describe it. Through prediction, AI can also strengthen prevention. Many incidents follow patterns, such as repeated near misses in the same location, equipment problems, poor housekeeping, or fatigue from overtime and long shifts. By analysing incident records, maintenance logs, shift schedules, and environmental conditions like heat or dust exposure, AI tools can identify high risk areas and periods (Aminzadeh et al., 2025). This supports smarter planning for inspections, better allocation of safety officers, and targeted controls where risk is building up. For Nigerian organisations that have limited health, safety, and environment personnel (Ayeleso et al., 2024), this ability to prioritize is a direct boost to service quality. Training and compliance are another area where AI can raise standards. Nigerian workplaces often face uneven training, especially when staff are spread across branches or sites (Adamu et al., 2022). AI can help by recommending training based on job roles, recent incidents, and observed safety gaps. Short, personalized learning modules delivered through mobile phones can reinforce safe behaviour without pulling staff away for long classroom sessions. In higher risk sectors, simulated training can also build confidence and improve decision making during emergencies, which is often where mistakes become costly. AI can reduce paperwork and improve the quality of inspections and audits (Alhazmi et al., 2025). Rather than having unorganized paperwork such as scattered checklists and reports, AI-enabled systems can standardize inspections, highlight missing information, and automatically generate clear action lists with deadlines and accountability (Sinha et al., 2024). This can improve documentation for internal reviews, client requirements, and regulatory expectations. Over time, the same data can be turned into dashboards that show trends, repeated hazards, and recurring noncompliance. These insights can help management make better decisions and invest in the most effective safety improvements.

Equipment and maintenance safety can also improve significantly. In manufacturing, power, and oil and gas settings, failures in machines and tools contribute to injuries and operational downtime (Sinha & Lee, 2024). AI can support predictive maintenance by analyzing sensor data such as temperature, vibration, or abnormal performance patterns to detect faults early (Polymeropoulos et al., 2025). This reduces sudden breakdowns and emergency repairs, which are often high-risk moments for workers. When equipment reliability improves, service delivery improves too, because safety teams spend less time reacting to crises and more time preventing them. In Nigerian workplaces, the benefits of AI must be balanced with real constraints. For example, power supply, internet coverage and cost, and data quality can limit the application of AI. However, these challenges can be managed through practical approaches such as offline-first reporting tools, starting with small pilot projects, and focusing on high impact areas like PPE compliance, hazard reporting, and equipment monitoring. Clear policies on privacy and responsible use are also worthy of note so workers can understand that the goal is safety and service improvement.

Conclusion

Integrating AI into occupational health and safety in Nigeria is not primarily a technology project. It is a service delivery reform. Nigeria's OHS ecosystem is shaped by legal frameworks alongside a labour market where informal work is the dominant reality. AI can improve safety outcomes by strengthening reporting, speeding response, improving training retention, and helping safety teams focus on the highest risk activities. However, success depends on NDPA compliant governance, trust building, and phased deployment that respects Nigeria's infrastructure constraints and workforce diversity. If these conditions are met, AI enabled OHS can move from a compliance driven function to a consistent service that protects workers and improves productivity across Nigerian workplaces.

Recommendation

Consequent upon the conclusion drawn from this paper, it is therefore recommended that:

1. AI should be deployed in OHS in Nigerian workplace to facilitate the smooth service delivery
2. All present and perceived constraints to the deployment of AI such as power supply, poor internet facilities, and low technical know-how should be promptly addressed to forestall their negative impact on the deployment of AI

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