



(REVIEW ARTICLE)



## Towards safer automotive practices and sustainable end-of-life vehicle management in the Nigerian automotive service sector

Agboneni O<sup>1</sup>, Ejilal IR<sup>2,\*</sup>, Viza E<sup>3</sup>, Omorogbe O<sup>4</sup>, Daser-Adams J<sup>5</sup> and Adakole SO<sup>6</sup>

<sup>1</sup> Department of Research & Development, Nenis Engineering Co. Ltd, # 143 Obafemi Awolowo Road, Ota-Ona, Ikorodu, Lagos, Nigeria. 104101.

<sup>2</sup> Department of Mech/Prod Engineering, Abubakar Tafawa Balewa University, Bauchi, Nigeria.

<sup>3</sup> School of Computing, Engineering and Physical Sciences, University of West of Scotland, Scotland. United Kingdom.

<sup>4</sup> Department of Mechanical Engineering, Ahmadu Bello University, Zaria, Nigeria. 810106.

<sup>5</sup> Department of Technology Education & Research, Autolady Engineering Tech., Ltd., Abuja, Nigeria. 901101.

<sup>6</sup> Department of Bioengineering Systems, Saint Petersburg Electrotechnical University, Saint Petersburg, Russia.

World Journal of Advanced Engineering Technology and Sciences, 2023, 10(02), 088–095

Publication history: Received on 13 October 2023; revised on 26 November 2023; accepted on 28 November 2023

Article DOI: <https://doi.org/10.30574/wjaets.2023.10.2.0296>

### Abstract

The primary aim of this paper is to enhance safety, health, and environmental practices prevalent in Automotive workshops in Nigeria. Emphasising a comprehensive approach to vehicle safety, the study focuses on a review of pivotal aspects such as training, rigorous risk assessment, adherence to compliance standards, and a commitment to continuous improvement, encouraging best practices adoption, and fostering workplace safety and environmental awareness within the context of Nigeria's automotive service sector. It also seeks to bridge the gap between day-to-day safety and long-term concerns during vehicle decommissioning, and provide a resource material for industry stakeholders, advocating for best practices that elevate workplace safety, reduce injuries, and address environmental impacts across vehicles' lifespans, including their end-of-life phase. Implementing these principles could strengthen Nigeria's automotive industry by fostering a robust safety culture and environmentally responsible vehicle decommissioning. Ultimately, the paper would promote a "safer end" perspective, advocating for holistic safety approaches geared towards responsible and sustainable end-of-life vehicle management in Nigeria's automotive service sector.

**Keywords:** Safe automotive works; Risk assessment; Compliance; Safer-end perspective; Sustainable management

### 1. Introduction

The Nigerian automotive industry is a crucial component of the nation's economic framework, serving as a vital conduit for transportation and commerce. It faces multifaceted challenges, including infrastructural deficits, a scarcity of skilled labour, and benchmarks for safety that lag international standards. These issues are compounded by the lack of domestic vehicle manufacturing, leading to a heavy reliance on imported vehicles, many of which are second-hand. This reliance poses significant concerns about vehicles' safety and environmental sustainability at the end of their life cycle, drawing attention to the critical need for improved end-of-life vehicle management [1].

Despite these challenges, the industry has demonstrated growth and resilience. Recently, the National Bureau of Statistics recorded 11.8 million registered vehicles in Nigeria, a testament to the industry's significant role in the nation's mobility infrastructure [2,3]. The preponderance of these vehicles fulfils commercial functions, underscoring their contribution to the Nigerian economy [4]. The automotive sector is a considerable employer, with over 1.5 million people engaged in various capacities, both directly within the industry and in ancillary services. This workforce is a

\* Corresponding author: Ejilal IR.

critical asset, and their safety and well-being are paramount, particularly given the potential hazards associated with vehicle maintenance, repair, and eventual decommissioning [5].

The Nigerian automotive industry, while pivotal for national development, contends with challenges such as infrastructural inadequacies, labour deficits, and inadequate safety benchmarks, which are exacerbated by the lack of domestic vehicle production and dependence on imported, often second-hand vehicles [1]. Despite these obstacles, the sector demonstrates resilience, evidenced by its growth to approximately 11.8 million registered vehicles and its substantial contribution to employment, engaging over 1.5 million workers [4]. Addressing these challenges head-on, there is a concerted effort to enhance workforce skills and raise safety awareness, aligning with a global shift towards stringent safety protocols and environmental standards [6]. As the industry embraces a compliance-focused culture, it lays a foundation for sustainable growth. It ensures that safety and environmental responsibility become ingrained in its operations and contribute to the 'safer end' of vehicle lifecycles [7].

Within this landscape of intricate machinery and elaborate electrical systems, the safety, health, and environmental well-being of the workforce and the broader ecosystem emerge as critical concerns [8]. Therefore, the Nigerian automotive sector's developmental trajectory has begun to pivot towards enhancing safety and health practices, with governmental and industry stakeholders advocating for adopting stringent standards in line with global trends [9].

Initiatives to address these challenges are multifaceted. They encompass comprehensive training programs to equip the workforce with the requisite skills, knowledge, and safety consciousness. Emphasis on compliance with both local and international regulations fosters an environment where the well-being of automotive workers and the preservation of the environment are prioritised. Tailored safety guidelines that address specific risks, such as electrical and fire safety, are critical to this sector's transformation.

Effective waste management strategies, including waste segregation and recycling, are fundamental to ensuring sustainable practices in automotive workshops. These practices contribute to protecting the environment and promoting a culture of safety and accountability. The Nigerian automotive industry is making efforts to establish a thorough incident reporting and investigation framework, as well as a commitment to continuous improvement to prioritize safety, health, and environmental protection in daily operations [5]. These initiatives aim to go beyond regulatory obligations and integrate safety, health, and environmental considerations into the industry's core values [10].

This paper seeks to amplify these discussions, examining the safety standards in the automotive maintenance and repair industry and proposing a pathway that responds to current challenges and anticipates the safe and responsible decommissioning of vehicles at their life's end.

---

## **2. Challenges in the Nigerian Automotive Industry.**

Concerns about occupational health and safety (OHS) have grown in recent decades, with workplace accidents driving this trend. [11] Work-related accidents can result in serious injuries, and in some cases, cause fatalities. According to the International Labour Organization (ILO), 2.2 million people die each year as a direct result of work-related accidents, with an additional 270 million in non-fatal workplace accidents that have resulted in an injury [12]. Not to mention the direct and indirect financial consequences of such accidents.

The Nigerian automotive industry's landscape is marked by complex challenges that threaten to undermine its growth and the safety of its workforce. Unlike the developed nations, where stringent safety regulations and advanced safety mechanisms are embedded into the industry's fabric, Nigeria's automotive sector is characterised by a more rudimentary approach to safety—a reality that is evidenced by a scarcity of modern safety equipment, infrequent equipment maintenance, and a general scarcity of knowledge concerning robust safety measures [13].

The Nigerian automotive sector, predominantly staffed by informal labour, has historically been marked by a lack of strict compliance with occupational safety and health regulations, making the Safe Automotive Works (SAW) project more critical [14,15]. This precarious situation is aggravated by the prevalent use of hazardous materials and chemicals, which pose severe risks to human health and the environment without proper handling and disposal practices. The industry is also challenged by a weak infrastructure for health and safety leadership, resulting in a landscape where accidents and occupational diseases are not uncommon [16].

However, the SAW project, conceived and implemented by Nenis Auto Care and funded by the Royal Academy of Engineering in partnership with Lloyd's Register Foundation under the Engineering X programme, stands as a beacon

of progress. This initiative has been instrumental in the development and dissemination of a Code of Practice for Safe Automotive Workers in Nigeria—a pioneering document that encapsulates best practices for risk assessment, safe handling of hazardous substances, and emergency response procedures. This code is significant as it provides a standardized reference point for enhancing safety protocols within the sector. The project not only aims to mitigate the immediate risks faced by automotive workers but also strives to lay the groundwork for long-term environmental sustainability and the responsible end-of-life management of vehicles. The active engagement of the Royal Academy of Engineering in sub-Saharan Africa, including Nigeria, reflects a commitment to fostering safety and sustainability beyond the borders of the United Kingdom through collaborative research, policy formulation, and capacity-building initiatives. The Academy has played a crucial role in elevating the standards of safety and environmental practices to international levels [17].

In light of the foregoing, this paper further seeks to chart a course for the Nigerian automotive industry in a manner that embraces comprehensive safety measures, robust training programs, and a culture of continuous improvement. By examining the challenges, the paper will also argue for the adoption of a lifecycle approach to vehicle management—emphasizing the need for vehicles to be maintained safely and decommissioned in a manner that is environmentally responsible and aligns with the concept of a 'safer end'.

---

### **3. Safety Protocols and Training Initiatives**

The need for designing tailored training programs specific to Nigerian automotive workers emerges as a compelling imperative in the quest for sustainable safety practices within the industry. The Nigerian automotive sector, while progressively evolving, currently grapples with the absence of a standardized and comprehensive training framework for its workforce. This deficiency results in inadequate safety awareness and the cultivation of sub-optimal skills among workers [18,19,20]. Addressing these substantial gaps necessitates the development of training initiatives that are astutely attuned to the unique local context, with a keen understanding of the challenges faced by Nigerian workers.

Constructing a comprehensive training program for the Nigerian automotive industry entails a nuanced approach that takes into account the specific conditions that characterize this industrial landscape. Pertinent factors, including local cultural practices, prevailing socioeconomic conditions, and the reality of understaffed workshops, must be thoughtfully integrated into the training design [21]. The envisioned training program must aspire to empower automotive workers with a judicious blend of theoretical knowledge and practical skills, equipping them to adeptly navigate the array of safety issues prevalent in their workplaces. It should not only impart knowledge but also provide practical approaches for proactively managing hazards.

Importantly, the efficacy of these training programs hinges on the seamless transfer of acquired skills and knowledge from the training context to the actual workplace. Adopting robust pedagogical practices is instrumental in bringing this divide. Engaging training methods, such as simulations or case studies, can ensure that the skills acquired are not merely theoretical but practically applicable, thereby significantly enhancing shop floor safety [22]. Furthermore, a pivotal element in these programs lies in the incorporation of up-to-date legal and industry regulations and standards. This inclusion plays a dual role, enhancing awareness regarding the responsibility of maintaining a safe and healthy working environment while fostering compliance with the prevailing norms.

For these training initiatives to be truly effective, an integrated evaluation mechanism should be an intrinsic component. This evaluation can take diverse forms, encompassing feedback mechanisms, post-training tests, and observational studies in real-world work settings [22]. By continuously monitoring and assessing the efficiency of these programs, adaptations and refinements can be promptly instituted, ensuring that they remain dynamically aligned with the evolving needs of the Nigerian automotive industry.

---

### **4. The Imperative of Effective Waste Management Strategies in the Automotive Industry.**

The Nigerian automotive industry as a key driver of economic growth, faces critical environmental challenges, particularly in the realm of waste management. The sector's workshops produce a diverse range of waste streams, many containing hazardous substances like solvents and batteries. This waste, if not properly managed, leads to significant environmental pollution and poses serious health risks [23, 24]. The indiscriminate dumping of such waste, and the haphazard decommissioning of vehicles that have reached their end-of-life, exacerbates these risks, highlighting the urgent need for sustainable waste management practices.

#### **4.1. Transitioning to sustainable waste management.**

A paradigm shift towards sustainable waste management is imperative. This involves embracing the principles of 'Reduce, Reuse, Repair, Recycle, and Upcycle', a strategy effectively implemented by Nenis Auto Care Automobile Garage in Nigeria. This approach goes beyond traditional methods by incorporating repair and upcycling, thus maximizing resource efficiency and reducing overall waste. Such practices not only mitigate environmental harm but also contribute to the economic sustainability of the workshops.

#### **4.2. Environmental responsibility and worker training.**

Instilling a sense of environmental responsibility among automotive workers is crucial. Comprehensive training programs focused on sustainable waste management practices can significantly impact this effort. These programs should cover incident reporting, investigation procedures, and root cause analysis, specifically targeting waste management hazards. This training will ensure that workers are not only aware of the environmental impacts of their actions but are also equipped to take proactive measures in waste handling and disposal.

#### **4.3. Continuous improvement in waste management.**

To maintain the effectiveness of waste management strategies, a commitment to continuous improvement is essential. Regular evaluations of waste management practices will help identify areas needing refinement. This ongoing process ensures that the automotive industry not only minimises its environmental footprint but also actively contributes to public health and safety. By constantly updating and improving waste management practices, the industry can stay ahead of environmental challenges and set a standard for responsible operation.

---

### **5. Fostering a Culture of Continuous Improvement**

The Nigerian automotive industry faces a substantial challenge in instilling a culture of continuous improvement in safety, health, and environmental practices, which is integral to its sustained success and long-term sustainability. Harley's models of continuous improvement emphasise the importance of engaging all levels of the workforce, fostering open communication, promoting team effort, and monitoring performance [25]. Harley's models underscore the significance of key elements such as employee engagement, open communication, teamwork, and performance monitoring in driving positive transformations.

Employee Engagement emphasizes the active involvement of all employees, fostering collective ownership of safety [26]. Open communication plays a pivotal role in uncovering hidden hazards, promoting transparency, and creating an environment where workers feel empowered to voice concerns [27]. Teamwork is crucial in advancing safety practices, fostering collective responsibility, and facilitating the identification of safety gaps [28,29]. Performance monitoring is indispensable for tracking progress, pinpointing areas for improvement, and motivating employees by showcasing tangible impacts [30]. The imperative of continuous education and training is highlighted for empowering workers to recognize and control hazards, with advancements in learning methodologies providing efficient training delivery [31, 32].

---

### **6. Implementing a Comprehensive Code of Practice in Automotive Workshops**

In the Nigerian automotive industry, where the interplay of sophisticated machinery and hazardous materials presents inherent risks, the implementation of a comprehensive code of practice is vital. This code forms the cornerstone of workplace safety and environmental protection, providing clear guidelines and standards for everyday operations.

#### **6.1. The need for a robust code of practice.**

Enforcing and monitoring compliance with safety, health, and environmental standards is fundamental to the well-being of both workers and the environment. A comprehensive code of practice tailored to the specific needs and realities of Nigerian automotive workshops should include accountability measures, regular inspections, continuous monitoring, and active worker involvement [33,34]. This approach ensures not only adherence to legal requirements but also fosters a proactive safety culture.

#### **6.2. Accountability and continuous monitoring.**

To effectively implement safety policies, organizations must establish systems of accountability, regular checks, and continuous monitoring. The utilisation of digital monitoring systems can be particularly beneficial, offering real-time analysis of safety data, hazard identification, and compliance tracking [35]. Such systems, while representing a shift

towards technology-driven safety management, also require addressing the Nigerian industry's technical, economic, and socio-cultural challenges.

### **6.3. Worker involvement and empowerment.**

Empowering workers by involving them in safety decision-making processes is crucial. When workers are actively engaged and have a say in safety protocols, their understanding and adherence to these procedures significantly improve [34]. Establishing safety committees or worker representation can promote this active participation, enhancing the overall safety culture within workshops.

### **6.4. Role of trade associations and government regulation.**

Trade associations play a pivotal role in reinforcing safety codes. They can facilitate compliance mechanisms, provide specialized training, and engage industry players in a collective effort to uphold safety standards. Additionally, government regulation and oversight are critical. Strong regulatory frameworks, coupled with effective enforcement, ensure that all workshops adhere to established safety and environmental guidelines. This might necessitate bolstering the capacity of regulatory bodies and updating existing safety regulations in Nigeria [36].

### **6.5. Developing a culture of safety, health, and environmental responsibility.**

A comprehensive code of practice serves as a guiding framework, going beyond mere legal compliance. It instructs automotive workshops on creating and maintaining a culture that prioritises safety, health, and environmental responsibility. This code is not just a set of rules but a blueprint for instilling best practices in every aspect of workshop operations, ensuring the protection of workers, the public, and the environment.

---

## **7. Key Benefits of a Comprehensive Code of Practice.**

In the context of the Nigerian automotive industry, a well-crafted code of practice is a linchpin in achieving enhanced safety, health, and environmental stewardship. This code, by providing clear guidelines and best practices, plays a crucial role in shaping the industry's approach to these critical areas.

### **7.1. Clarity and specificity in safety guidelines.**

A comprehensive code of practice brings clarity and specificity to safety measures and procedures. It delineates the necessary steps and precautions tailored to address the unique challenges and risks inherent in the automotive industry. This clarity is instrumental in reducing misunderstandings and ensuring that all workshop personnel have a unified understanding of safety requirements. Such well-defined guidelines not only facilitate regulatory compliance but also serve as a proactive tool for risk management, significantly reducing the potential for workplace accidents and environmental mishaps.

### **7.2. Standardisation of safety practices across the industry.**

The development of a standardised approach to safety is another critical benefit of a comprehensive code of practice. It ensures uniformity in safety practices across various automotive workshops, thereby promoting a consistent and safety-conscious culture within the industry. Standardized procedures, especially in areas like vehicle lifting, handling hazardous materials, and fire safety, are vital in minimising the risk of accidents and injuries. This uniformity in safety practices also extends to interactions with the public, enhancing the industry's reputation for safety and reliability.

### **7.3. Cultivating a safety-oriented culture.**

The implementation of a code of practice is instrumental in fostering a culture centred around safety, health, and environmental responsibility. It encourages workshops to invest in ongoing safety training and education, thus ingraining safety as a fundamental aspect of their operations. This safety-oriented culture aligns with the overarching goal of continuous improvement and compliance, reinforcing that safety is an essential, non-negotiable aspect of the automotive industry. Such a culture safeguards the workforce and the public and bolsters the industry's image as a responsible and forward-thinking sector.

### **7.4. Enhancing industry reputation and competitiveness.**

A comprehensive code of practice does more than ensure safety and compliance; it positions the Nigerian automotive industry as a leader in responsible business practices. By adhering to high standards of safety and environmental care, the industry can enhance its competitive edge and reputation domestically and in the global market. This positive

reputation, built on a foundation of safety and responsibility, can open new opportunities for growth and collaboration, contributing significantly to the industry's overall sustainability and success.

---

## **8. Recommendations for a Safer and Responsible Automotive Industry.**

As a cornerstone of the nation's economic growth, the Nigerian Automotive industry faces the urgent need to prioritize safety and responsibility. The active nature of the industry calls for the need for the development and implementation of a robust code of practice to safeguard the well-being of workers and their surrounding environment. To achieve this goal, the following recommendations are proffered:

Develop robust and comprehensive training programs within the Nigerian automotive sector that include safety protocols and environmental awareness.

Establish precise safety guidelines to ensure standardized practices, mitigating the risk of accidents resulting from ambiguous directives. Ensure consistency in risk mitigation across various facets, from vehicle lifting to hazardous material handling and fire prevention.

Nigerian regulatory bodies- such as the Standard Organisation of Nigeria should rise up to the occasion of providing stringent audits and inspections to uphold responsible industry practices and instil a culture of safety and responsibility [37].

There is a need to prioritize investment in advanced safety equipment, such as cutting-edge gear, fire prevention tools, and waste management facilities within Nigerian automotive workshops, to provide comprehensive protection to workers.

This calls for the need to implement a comprehensive code of practice encompassing incident reporting, continuous improvement, public awareness, and education within the Nigerian automotive industry.

Foster a culture of safety and continual enhancement by encouraging incident reporting, thorough investigations, and taking corrective actions.

Engage the community through educational initiatives and transparent communication to extend the responsibility for safety and environmental protection beyond the confines of workshops.

Emphasize the importance of dynamic safety approaches by regular assessments to identify areas for improvement while ensuring ongoing relevance and effectiveness of safety practices as the Nigerian automotive industry evolves.

Endorse responsible decommissioning approaches to ensure safer-end-of life vehicles to minimize environmental impact.

The implementation of these recommendations will empower the Nigerian automotive industry to establish a comprehensive code prioritizing safety, health, and environmental well-being. This commitment will not only augment the industry's standing but also foster a sustainable and flourishing sector that is contributing to the nation's economic prosperity and societal well-being.

---

## **9. Conclusion**

In conclusion, the implementation of a robust code of practice is unarguably a cornerstone for safe automotive work. Such a code, detailed in its approach and tailored to the unique context of Nigeria's automotive sector, offers clarity, consistency, and a standardised framework for safety and environmental practices. It goes beyond mere regulatory compliance, embedding a proactive culture of safety and responsibility within every facet of the industry.

Key recommendations have also been suggested to ensure the practical application of these principles as a step towards creating a safer, more responsible, and more sustainable automotive industry. Hence, by embracing these recommended strategies and fostering a culture of safety, health, and environmental responsibility, the industry can secure its own sustainable future and contribute significantly to the nation's economic prosperity and societal well-being. This journey towards a safer and more responsible automotive sector is not just an industry goal but a collective responsibility that will pave the way for a safer, more efficient, and environmentally conscious Nigeria.

---

## Compliance with ethical standards

### *Acknowledgements*

The authors would like to thank the Royal Academy of Engineering and the Lloyd's Register Foundation under the Engineering X 2021/2023 scheme, without whom we could not deliver our programmes and develop a draft code of practice for health safety and environmental protection in automotive works to the Nigerian Standard Organisation.

### *Disclosure of Conflict of Interest*

The authors have declared that no competing interests exist.

---

## References

- [1] Odiboh, O., Nwosu, E., Ekanem, T., and Oyedepo, T., 2022. Public Acuity, Homemade Vehicles and Public Relations in Nigeria. *Journal of South African Business Research*. DOI: 10.5171/2022.960007.
- [2] NBS (2018) Nigeria Bureau of Statistics. Road Transport Data (Q4 2018). <https://nigerianstat.gov.ng/elibrary/read/903>
- [3] Paul, E. (2020). The state of Nigeria's automotive industry and its far-reaching effects. <https://techpoint.africa/2020/12/22/nigerias-automotive-industry/>
- [4] Wang, A.Y.-M., (2022). The Impact of Manufacturing Sector on Economic Growth in Nigeria. DOI: 10.21203/rs.3.rs-2203096/v1.
- [5] Caesar, L.A., Yulius, 2023. Relationship between Corporate Social Responsibility and Environmental Sustainability with Customers' Purchase Intention: Study on Indonesian Automotive Customers in Pandemic Situation. *Nucleation and Atmospheric Aerosols*. Available from: DOI: 10.1063/5.0109632.
- [6] Adubor, N.V., Adeniji, A., Salau, O.P., Olajugba, O.J., and Onibudo, G.O., 2022. Exploring Green Human Resource Adoption and Corporate Sustainability in Nigerian Manufacturing Industry. *Sustainability*. DOI: 10.3390/su141912635.
- [7] Yahaya, A., Sulaiman, S.M., and Aminu, H.A., (2022). Patronage Factors of Motor Vehicle Takaful in Kano State, Nigeria. *International Journal of Islamic Economics and Finance*. DOI: 10.18196/ijief.v5i2.14970.
- [8] Okoye, C. O. (2017). Safety management in developing countries: a case study of Nigeria. *Procedia Manufacturing*, 7, 659-665.
- [9] Ohakwe, J., Emerole, G., & Asiagwu, D. (2010). The impact of road traffic injury in South Eastern Nigeria. *International Journal of Injury Control and Safety Promotion*, 17(3), 165-169.
- [10] Ropin, H. and Supan, R., 2020. Electromobility and Its Effects on Automotive Workshops. Available from: DOI: 10.31803/TG-20200711221534.
- [11] Al Zarooni, M., Awad, M., & Alzaatreh, A. (2022). Confirmatory factor analysis of work related accidents in UAE. *Safety Science*, 153, 105813. <https://doi.org/10.1016/j.ssci.2022.105813>.
- [12] Burke, R. J., Clarke, S., & Cooper, C. L. (Eds.). (2011). *Occupational health and safety*. Gower Publishing, Ltd.
- [13] Ozor, P., & Uzoma, C. M. (2020). A Review of Occupational Health and Safety Related to the Nigerian Informal Sector. Technical Report. National Institute for Health Research, NIHR20006.
- [14] Diugwu, I.A., Baba, D.L. and Egila, A.E. (2012) Effective Regulation and Level of Awareness: An Expose of the Nigerian's Construction Industry. *Open Journal of Safety and Technology*, 2, 140-146. <https://doi.org/10.4236/ojsst.2012.24018>
- [15] Rockefeller Foundation (2013). Health Vulnerabilities of Informal Workers. May 2013. <https://www.rockefellerfoundation.org/wp-content/uploads/Health-Vulnerabilities-of-Informal-Workers.pdf>
- [16] Adelabu, D. J., & Awoyemi, O. (2020). Health Risk Evaluation of Heavy Metals Contamination of Road-Deposited Sediment in Used Auto Parts Markets in Nigeria. *Environmental Health Insights*, 14, 1178630220915552.
- [17] Ettridge, M., & Sharma, S. (2020). Engineering A Better World: Lessons from The Royal Academy of Engineering's International Development Activities. *Journal of International Development*, 32, 85–95 (2020) DOI: 10.1002/jid.3447

- [18] International Labour Office (ILO). Occupational Safety and Health. International Labour Organization. Geneva, Switzerland, 2021
- [19] International Labour Office (ILO). *Safety and Health at the Heart of the Future of Work*; International Labour Office (ILO): Geneva, Switzerland, 2019.
- [20] World Health Organization. (2021). WHO/ILO joint estimates of the work-related burden of disease and injury, 2000–2016: global monitoring report.
- [21] Elo, S., & Kääriäinen, M. (2018). The qualitative content analysis process. *Journal of Advanced Nursing*, 62(1), 107–115.
- [22] Rahman, N. A., & Hasim, M. S. (2020). A review on training evaluation: Is it effective? *Procedia Economics and Finance*, 35, 700–705.
- [23] Adogun, P. O. U., Ilika, A. L., & Asuzu, M. C. (2009). Predictors of Responsible Solid Waste Disposal in a Semi-Urban Town in Nigeria. *Niger J Med*, 18(1), 4-9.
- [24] Adogun, P. O. U., Ilika, A. L., & Asuzu, M. C. (2009). Predictors of Responsible Solid Waste Disposal in a Semi-Urban Town in Nigeria. *Niger J Med*, 18(1), 4-9.
- [25] Tudor, T. L., Barr, S. W., & Gilg, A. W. (2008). A novel conceptual framework for examining environmental behaviour in large organizations: a case study of the Cornwall National Health Service (NHS) in the United Kingdom. *Environment and Behavior*, 40(3), 426-450.
- [26] Harley, B. (1998). Arm's Length Contracts and Intra-firm Governance. In P. Sparrow, & M. Marchington (Eds.), *Human Resource Management: The New Agenda*. London: Pitman Publishing.
- [27] OSHA, (2021). Safety and Health Programs. Retrieved from OSHA: <https://www.osha.gov/safety-management>
- [28] HSE, (2021). Employee Training. Retrieved from HSE: <https://www.hse.gov.uk/toolbox/managing/training.htm>
- [29] Marchington, M. and Wilkinson, A. (2008). *Human Resource Management at Work: People management and development*. 4th ed. CIPD: London
- [30] Rother, M. (2010). *Toyota Kata: Managing People for Improvement, Adaptiveness and Superior Results*. New York: McGraw-Hill.
- [31] Hopf, S. C., Crowe, K., Verdon, S., Blake, H. L., & McLeod, S. (2021). Advancing workplace diversity through the culturally responsive teamwork framework. *American Journal of Speech-Language Pathology*, 30(5), 1949-1961.
- [32] Liker, J. K. & Franz, J. K. (2011). *The Toyota Way to Continuous Improvement: Linking Strategy and Operational Excellence to Achieve Superior Performance*. New York: McGraw Hill.
- [33] HSE, (2021). Employee Training. Retrieved from HSE: <https://www.hse.gov.uk/toolbox/managing/training.htm>
- [34] Uden, L., Liberona, D., & Feldmann, B. (2010). *Learning Technology for Education in Cloud: The Changing Face of Education*. Springer.
- [35] Zimnicki, M. (2020). Safety culture development in an organisation – Diagnosis and improvement suggestions. *Safety Science*, 121, 65-74.
- [36] Ceylan, C. (2019). Industry 4.0 and digitisation for workplace safety. In *Conference Proceedings on Occupational Health and Safety*.
- [37] Olanipekun, A., Xiang, Q., & Wang, J. (2017). Strategies for enforcing safety codes of practice in the construction industry. In *International Conference on Advanced Information and Communication Technology for Education*.
- [38] Oyedepo, J., Kilanko, O., Adefila, S., & Odigure, J. (2013). Strategies for Improving Safety Standards in the Nigerian Manufacturing Industries. *Journal of Safety Engineering*, 2(2), 9-18.
- [39] SON (2023). Standard Organisation of Nigeria. Downloaded on 10/11/2023 from <https://www.iso.org/member/1982.html#:~:text=The%20mandate%20of%20the%20Organisation,goods%20and%20services%3B%20improvement%20of>