Towards Effective Occupational Health and Safety: Optimising Technology for Human Rights and Sustainability

Kariuki Muigua

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Kariuki Muigua*

Abstract

This paper critically discusses how technology can be harnessed appropriately towards effective Occupational Health and Safety (OHS). The paper argues that technology has the potential to transform workplaces towards ensuring OHS. The paper gives examples of relevant technologies and their role in fostering OHS. In addition, the paper argues that utilising technology in promoting OHS can create several challenges including human rights violations. As a result, the paper posits that technology should be harnessed effectively in order to support and not undermine workers' safety and health. The paper proposes solutions towards optimising technology towards effective OHS for human rights and sustainability.

1.0 Introduction

Occupational Health and Safety (OHS) also referred to as Occupational Safety and Health (OSH) has been defined as the science of the anticipation, recognition, evaluation and control of hazards arising in or from the workplace that could impair the health and well-being of workers, taking into account the possible impact on the surrounding communities and the general environment[1]. It has also been defined as a practice that deals with the safety, health, welfare and wellbeing of people when they are at work[2]. According to the International Labour Organization (ILO), OHS deals with all

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* PhD in Law (Nrb), FCIArb (Chartered Arbitrator),OGW, LL. B (Hons) Nrb, LL.M (Environmental Law) Nrb; Dip. In Law (KSL); FCPS (K); Dip. in Arbitration (UK); MKIM; Mediator; Consultant: Lead expert EIA/EA NEMA; BSI ISO/IEC 27001:2005 ISMS Lead Auditor/ Implementer; ESG Consultant; Advocate of the High Court of Kenya; Professor of Environmental Law and Conflict Management at the University of Nairobi, Faculty of Law; Member of the Permanent Court of Arbitration (PCA) [May, 2025].

[1] Alli. B., 'Fundamental Principles of Occupational Health and Safety' International Labour Organization, 2nd Edition, 2018

[2] What is Occupational Health and Safety?., Available at https://www.britsafe.org/training-and-learning/informational-resources/what-is-occupational-health-and-safety (Accessed on 06/05/2025)

aspects of health and safety at the workplace[3]. ILO further points out that the goal of OHS is to prevent the occurrence of occupational accidents and diseases[4].

OHS is therefore an ideal that seeks to ensure safe and healthy working environments. It has been argued that a safe and healthy working environment is one where risks are eliminated or when all reasonably practicable actions have been taken to reduce risks to an acceptable level and where risk prevention has been integrated as part of the organizations culture[5]. OHS seeks to create safe and healthy working environments by preventing work-related injuries and diseases, as well as ensuring the protection and promotion of the health of workers[6]. It also seeks to promote safe and healthy working environments by improving the working conditions and working environments for workers and ensuring their safety and health is maintained while working and providing compensation if a work-related injury occurs[7]. OHS therefore seeks to protect the rights of workers and ensure that all work is consistent with workers' well-being and human dignity[8].

Ensuring safe and healthy working environments through OHS is a fundamental right for workers which is enshrined under several instruments at the global level. For instance, the *Universal Declaration of Human Rights[9]* stipulates the right of every person to work which includes the requirement for *just and favourable conditions of work[10]*. In

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[3] International Labour Organization., 'Occupational Safety and Health' Available at https://www.ilo.org/bureau-employers-activities/areas-work/occupational-safety-and-health (Accessed on 06/05/2025)

[4] Ibid

[5] Ibid

[6] United Nations Global Compact., 'A Safe and Healthy Working Environment' Available at https://unglobalcompact.org/take-action/safety-andhealth (Accessed on 06/05/2025)

[7] Ibid

[8] Alli. B., 'Fundamental Principles of Occupational Health and Safety' Op Cit

[9] United Nations General Assembly, *Universal Declaration of Human Rights*, 217 A (III), 10 December 1948

[10] Ibid, article 23 (1)

addition, the *International Covenant on Economic, Social and Cultural Rights*[11] urges all states to recognize the right of everyone to the enjoyment of just and favourable conditions of work, and in particular the right to *safe and healthy working conditions*[12]. This right has also been recognised by the ILO through several instruments including the *ILO Constitution*[13], the *ILO Declaration on Fundamental Principles and Rights at Work*[14], and the *Occupational Safety and Health Convention*[15].

Ensuring effective OHS is also a crucial development agenda for the global community as envisaged under the United Nation's *2030 Agenda for Sustainable Development*[16]. Under the Agenda, Sustainable Development Goal (SDG) 8 calls upon the global community to promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all[17]. Among the targets under SDG 8 is to protect labour rights and promote safe and secure working environments for all workers[18]. In addition, African Union's *Agenda 2063*[19] aims to foster decent employment, labour standards and safe working conditions for all in order to achieve the ideal of a prosperous Africa based on inclusive growth and Sustainable Development[20]. Ensuring OHS is therefore a pertinent ideal both globally and in Africa.

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[11] United Nations General Assembly, *International Covenant on Economic, Social and Cultural Rights*, United Nations, Treaty Series, vol. 993, p. 3, 16 December 1966,

[12] Ibid, article 7 (b)

[13] International Labour Organization (ILO), Constitution of the International Labour Organisation (ILO), 1 April 1919

[14] International Labour Organization Declaration on Fundamental Principles and Rights at Work., Available at https://www.ilo.org/wcmsp5/groups/public/---ed_norm/---declaration/documents/publication/wcms_467653.pdf (Accessed on 06/05/2025)

[15] Occupational Safety and Health Convention, 1981 (No. 155)

[16] United Nations General Assembly., 'Transforming Our World: the 2030 Agenda for Sustainable Development.' 21 October 2015, A/RES/70/1., Available at https://sustainabledevelopment.un.org/content/documents/21252030%20Agenda%20for%20Sustainable%20Development%20web.pdf (Accessed on 06/05/2025)

[17] Ibid

[18] Ibid, SDG 8.8

[19] Africa Union., 'Agenda 2063: The Africa we Want' Available at https://au.int/sites/default/files/documents/33126-doc-framework_document_book.pdf (Accessed on 06/05/2025)

[20] Ibid

This paper critically discusses how technology can be harnessed appropriately towards effective OHS. The paper argues that technology has the potential to transform workplaces towards ensuring OHS. The paper gives examples of relevant technologies and their role in fostering OHS. In addition, the paper argues that utilising technology in promoting OHS can create several challenges including human rights violations. As a result, the paper posits that technology should be harnessed effectively in order to support and not undermine workers' safety and health. The paper proposes solutions towards optimising technology towards effective OHS for human rights and sustainability.

2.0 Role of Technology in Occupational Health and Safety: Opportunities and Challenges

Technology is playing an important role in ensuring OHS. It has been argued that technology offers solutions and innovative tools that improve safety, efficiency, and regulatory compliance in working environments[21]. Technology has become an integral component of OHS management playing crucial roles including tracking employee health and mitigating risks at the workplace[22]. Through technology, new and innovative tools have been developed to protect employees and reduce the risks of accidents and injuries at workplaces therefore ensuring OHS[23]. Further, it has been noted that technology not only enhances the effectiveness of safety measures at workplaces but it also makes it easier to identify and mitigate potential hazards in working environments[24].

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[21] Technological Solutions for OHS: Transforming Workplace Safety., Available at https://www.sabentis.com/en/blog/technologicalsolutions-ohs/ (Accessed on 06/05/2025)
[22] The Role of Technology in Advancing Occupational Health Management., Available at https://www.meddbase.com/the-role-of-technology-in-occupational-health-management/ (Accessed on 06/05/2025)
[23] The impact of technology on workplace safety., Available at https://www.sheilds.org/blog/impact-technology-workplace-safety/ (Accessed on 06/05/2025)
[24] Surendran. A., 'The Role of Technology in Enhancing Occupational Safety' Available at https://www.linkedin.com/pulse/technologies-enhancing-occupational-health-safety-anoop-ipbbc/ (Accessed on 06/05/2025)

Harnessing technology is considered as an effective approach towards improving workers' health and safety conditions in working environments[25]. For instance, it has been pointed out that in manufacturing and other industries that require heavy machinery and large equipment, machine guarding is a huge part of safety[26]. In addition, technology has led to the development of wearable devices including smart helmets, vests and watches which monitor and ensure worker safety by tracking vital signs related to OHS, detecting fatigue among workers and monitoring the exposure of workers to hazardous substances[27]. Technological solutions such as safety management software are also strengthening OHS by facilitating risk assessment, tracking incidents at the workplace and generating accurate reports on OHS[28]. In addition, it has been observed that mobile applications are allowing employees to quickly and efficiently report incidents at workplaces and access information concerning their health and safety[29].

According to ILO, emerging technologies including Artificial Intelligence (AI) and digital tools are revolutionizing OHS[30]. For instance, robots are operating in hazardous working environments, doing the heavy lifting that may be dangerous to the health and safety of human beings, managing toxic materials and working in extreme temperatures[31]. In addition, it has been pointed out that digital tools such as drones and robots are being utilised to perform tasks that are dangerous for humans including inspecting high-rise buildings and structures, exploring confined spaces, and handling hazardous

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[25] Mohammadi. H., Rabiei. H., Dehghan. S., 'Emerging Technologies in Occupational Health and Safety' Available at https://www.frontiersin.org/research-topics/27124/emerging-technologies-in-occupational-health-and-safety/magazine (Accessed on 06/05/2025)

[26] The Impact of Technology on Workplace Safety., Available at https://keninstitute.com/the-impact-of-technology-on-workplace-safety/ (Accessed on 06/05/2025)

[27] Ibid

[28] Technological Solutions for OHS: Transforming Workplace Safety., Op Cit

[29] Ibid

[30] International Labour Organization., 'Revolutionizing Health and Safety: The Role of AI and Digitalization at Work' Available at https://www.ilo.org/sites/default/files/2025-04/ILO_Safeday25_Report_EN_r8%2B%281%29.pdf (Accessed on 06/05/2025)

[31] Ibid

substances[32]. Digital tools can effectively handle repetitive and monotonous tasks in working environments while digital devices and sensors can detect hazards early on thus helping to mitigate injuries and accidents at work[33]. Further, it has been observed that automation and smart monitoring systems in workplaces can reduce exposure to hazardous substances, prevent workplace injuries and improve overall working conditions[34].

Technology including digitalization and automation is impacting millions of jobs globally providing numerous opportunities to improve OHS[35]. Technology is enhancing efficiency, ensuring the engagement of employees in OHS policies and saving costs by improving safety and reducing workplace injuries[36]. It has been observed that the quest to improve OHS and promote decent work for all has led to the adoption and utilization of technology including digital tools in working environments especially in hazardous occupations[37]. Technology is contributing significantly to hazard identification, risk monitoring and controlling, and the overall safety of workers at high-risk workplaces thus enhancing OHS[38]. Further, technology and digitalization supports career development for workers through tailored upskilling and reskilling opportunities, ensuring that workers can adapt to evolving job demands and be adequately prepared to address new OHS demands and risks[39].

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[32] Surendran. A., 'The Role of Technology in Enhancing Occupational Safety' Op Cit

[33] International Labour Organization., 'Revolutionizing Health and Safety: The Role of AI and Digitalization at Work' Op Cit

[34] International Labour Organization., 'Revolutionizing Health and Safety: The Role of AI and Digitalization at Work' Op Cit

[35] Ibid

[36] The Role of Technology in Advancing Occupational Health Management., Op Cit

[37] Dodoo. J.E et al., 'Digital Innovations for Occupational Safety: Empowering Workers in Hazardous Environments' Available at https://pmc.ncbi.nlm.nih.gov/articles/PMC10928957/ (Accessed on 06/05/2025)

[38] Ibid

[39] International Labour Organization., 'Revolutionizing Health and Safety: The Role of AI and Digitalization at Work' Op Cit

Despite its vital role in enhancing OHS, technology is associated with several risks and challenges which can undermine human rights and sustainability in workplaces. For instance, if improperly designed, wearable devices may lead to physical strain leading to potential injuries to workers[40]. In addition, unmanned aerial devices such as drones pose a risk of injuries and visual hazards[41]. Technology also raises privacy concerns due to tracking and monitoring of workers' personal information and data[42]. Further, costs related to acquisition and maintenance of technology including AI platforms and digital tools may be out of reach for small organizations therefore hindering effective OHS[43].

It has been argued that utilising technology in OHS may undermine human rights and well-being since workers may experience a loss of autonomy and control over their work, infringement of personal privacy, and feelings of job insecurity and displacement due to being constantly being monitored for lapses that can result in penalties[44]. This can increase anxiety, pressure and stress for workers[45]. According to ILO, technology can fuel 'technostress' with workers facing increasing pressure to adapt to rapidly evolving digital tools and processes[46]. In addition, AI-driven decision-making at workplaces may lead to task fragmentation, loss of job satisfaction and bias, potentially discriminating and marginalizing certain groups and creating inequalities in the workplace[47].

In light of the foregoing challenges, it is imperative to effectively harness technology towards enhancing OHS.

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[40] Ibid

[41] Ibid

[42] The Role of Technology in Advancing Occupational Health Management., Op Cit

[43] Ibid

[44] Koh. D., & Tan. A., 'Applications and Impact of Industry 4.0: Technological Innovations in Occupational Safety and Health' *Safety and Health at Work*., Volume 15, Issue 4 (2024)

[45] Ibid

[46] Ibid

[47] Ibid

3.0 Way Forward

Technology has a crucial role to play in ensuring effective OHS especially in high-risk occupations including manufacturing, mining, construction, transportation, and logging[48]. The integration of technology into OHS policies and practices is necessary in current fast-paced and dynamic work environments[49]. It is therefore necessary to optimise technology towards effective OHS while protecting human rights and fostering sustainability.

In order to harness technology appropriately towards effective OHS, it is imperative for organizations to conduct needs assessments in order to determine the appropriate technological tools and solutions that are relevant to their OHS needs[50]. This can help employers to adopt appropriate technology towards strengthening OHS. It is also necessary to continuously train workers in order to enable them embrace technology in work environments while also addressing the risks associated with digital technologies in the workplace[51]. The adoption of technology should also be implemented with the consultation of workers at all stages in order to protect their rights[52].

In addition, it has been argued that shift in mindsets is necessary for successful adoption of technology into OHS policies and strategies[53]. Workers should therefore be encouraged to view technology not as a rival but as a necessary and transformative solution that can enhance their health and safety and build their skills therefore enabling them to remain relevant in the job market[54]. Addressing transparency, date privacy and

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[48] Dodoo. J.E et al., 'Digital Innovations for Occupational Safety: Empowering Workers in Hazardous Environments' Op Cit

[49] Surendran. A., 'The Role of Technology in Enhancing Occupational Safety' Op Cit

[50] Technological Solutions for OHS: Transforming Workplace Safety., Op Cit

[51] International Labour Organization., 'Revolutionizing Health and Safety: The Role of AI and Digitalization at Work' Op Cit

[52] Ibid

[53] Koh. D., & Tan. A., 'Applications and Impact of Industry 4.0: Technological Innovations in Occupational Safety and Health' Op Cit

[54] Ibid

security, and bias concerns in technologies such as AI platforms is also crucial in strengthening OHS while safeguarding human rights[55].

Upon adoption of technology, regular risk assessment and monitoring is necessary in order to address challenges arising from technology and implement adjustments and improvements towards effective OHS[56]. It is also imperative to ensure that the benefits of technology are shared universally including through technology transfer in order to enable developing countries embrace technological solutions for effective OHS[57].

4.0 Conclusion

Technology provides solutions towards improving OHS. Technology offers effective and tailored strategies towards making workplaces safer and healthier[58]. However, in the absence of adequate measures, technology can undermine human rights and well-being through accidents, infringement of workers' privacy, reduced job control and work intensification[59]. It is therefore imperative to ensure that technology is appropriately harnessed and integrated into OHS policies and strategies while safeguarding human rights. Optimising technology for human rights and sustainability is therefore a key agenda that should be implemented towards effective OHS.

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[55] Ibid

[56] International Labour Organization., 'Revolutionizing Health and Safety: The Role of AI and Digitalization at Work' Op Cit

[57] Ibid

[58] 7 Technologies That Can Improve Occupational Health and Safety Practices., Available at https://ohsonline.com/articles/2023/06/05/7-technologies-that-can-improve-occupational-health-and-safety-practices.aspx?Page=2 (Accessed on 07/05/2025)

[59] International Labour Organization., 'Revolutionizing Health and Safety: The Role of AI and Digitalization at Work' Op Cit

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