


# Future Trends and Innovations: Exploring the Future Potential of AI in Occupational Health and Safety

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## ABSTRACT

*This chapter examines the incorporation of Artificial Intelligence (AI) into Occupational Health and Safety (OHS), representing a significant change in workplace safety management. It highlights the importance of AI technology in reducing risks, improving worker satisfaction, and increasing operational effectiveness in the workplace. Consideration is given to the functions of significant AI technologies in unsafe work automation, ergonomic assessments, health monitoring, and hazard identification. Some processes include predictive analytics, computer vision, machine learning, and natural language processing. Additionally, innovations that are altering safety training and skill development include wearable technology, augmented reality, and virtual reality. Alongside focusing on issues including employment displacement, regulatory gaps, and ethical problems, the chapter suggests multidisciplinary collaboration and strategic partnerships for AI-driven safety solutions.*

## 1. INTRODUCTION

Occupational Health and Safety (OHS) and workplace health promotion (WHP) is a field that aims to ensure the physical, mental, and social well-being of workers in their professional environments (Lu et al., 2024). Its primary goal is to prevent or limit workplace injuries, illnesses, diseases, and casualties by the reduction of ergonomic, psychosocial, and material risks while promoting a safety culture and agreement with legal standards. Over time, OHS has evolved from basic safety measures to a comprehensive approach to advanced technologies (Khodyreva, 2023). Occupational Health and Safety has progressed due to rapid industrialization, technological innovations, and community transformations, an

area for increased occupational illnesses and accidents hence the OHS was established (Neveling,2024). The foundation for monitoring and regulating working environments was founded by early legislation such as the Factories Act of 1833 in the United Kingdom, and the Occupational Health and Safety Act (OHSA) No. 85 of 1995 in South Africa (Spurgeon, 2012; Foromo et al.,2016). Soon governments and major organizations worldwide realized the importance of the protection of their workers and prompted the International Labour Organization (ILO) which was established in 1919 (Almakky, 2023).

The OHS systems are comprised of three primary categories namely Regulatory Compliance and Training, Health Promotion and Disease Prevention, and Hazard Identification and Risk Assessment (Ahmed et al.,2023). These significant pillars seek to identify potential workplace risks, develop and enforce mitigation plans, and pledge compliance with national and international OHS regulations (Id-ambi and Boniface, 2021). Digital technological advances, such as Artificial intelligence (AI), Internet of Things (IoT) integration, wearable technology, and mental health and well-being programs, have formed part of modern OHS procedures (Noudehi and Khameneh, 2023). According to current literature innovations in technology also include real-time workplace condition observation, hazard estimates, and safety mediation and optimization (Yuan et al.,2023). Specifically, it has been highlighted that wearable technology improves worker monitoring in high-risk sectors by tracking health data (Patel et al.,2022). The OHS has also acknowledged that mental health plays a crucial role in determining burnout, harassment, and other stress at work (Jain, 2021). The OSHA in the US and SA, expects employers to maintain safe workplaces, hence it is one of the laws and regulations that regulate OHS (Rikhotso et al.,2022).

Non-discrimination, guarding employee privacy, and maintaining a balance between automation and human supervision are all ethical issues currently being addressed (Hoxhaj et al.,2023). The field of OHS is dynamic, and transformative and aims to mitigate the obstacles posed by global health crises, demographic transitions, and automation. To ensure variation and robust workplaces, organizations are executing pre-emptive measures like analytical safety systems and flexible work schedules (Cebulla et al.,2023). It has been showcased that a safer workforce is protected by combining cutting-edge technologies, moral behaviour, and strict rules, which boosts organizational sustainability and productivity.

This chapter examines the integration of AI in OHS and its impact on workplace safety, risk management, and worker well-being. It explores AI applications such as hazard detection, predictive analytics, health monitoring, and workplace automation, along with emerging trends like robotics, augmented reality, and wearable devices. The chapter also addresses ethical, legal, and privacy concerns, as well as challenges and barriers to AI adoption. Finally, it provides policy recommendations and strategic approaches for effectively integrating AI to enhance workplace safety and well-being.

## **2. METHODOLOGY**

A literature search was conducted using the Web of Science™ Core Collection and Google Scholar databases in October 2024, covering journal articles, industry reports, and case studies in OHS. Data sources focused on key trends, challenges, and opportunities published from 2010 to December 2024. Keywords related to AI in OHS, such as Occupational Health and Safety; Artificial Intelligence; Workplace; Hazards; Health Monitoring, Risk management, and Ethical Considerations, were used. Only peer-reviewed studies published in English were included.

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