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THE GLOBAL IMPACT OF AI ON WORKPLACE SAFETY, OPPORTUNITIES AND CHALLENGES FOR THE FUTURE OF WORK

EL IMPACTO GLOBAL DE LA IA EN LA SEGURIDAD EN EL TRABAJO, OPORTUNIDADES Y DESAFÍOS PARA EL FUTURO DEL TRABAJO

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The Global Impact of AI on Workplace Safety, Opportunities and Challenges for the Future of Work

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ABSTRACT

Introduction: The arrival of technology, over the years, has had a very significant advance, so much so that it is transforming the work environment at an accelerated pace, generating both enthusiasm and concern in companies, workers and governments around the planet. The implementation of automated processes, operational streamlining, and the potential of intelligent platforms to learn and make decisions without human intervention are revolutionizing entire industries, from manufacturing to services, healthcare, and education. However, this technological advance presents a complex scenario: while AI promises to improve productivity, create new jobs and raise the quality of work, it also poses significant challenges, such as job displacement, the need for professional retraining and the increase in labor inequality. To examine the use of smart technology applications in the mitigation of union fatalities, the strengthening of the physical and emotional well-being of personnel and the optimization of safety processes in different sectors **Methodology:** The methodology adopted consists of a rigorous bibliographic review that covers a documentary period of five years ago. Reliable documentary sources will be consulted using relevant keywords in both Spanish and other languages to ensure a broad and internationalized view of the topic. **Results:** The deployment of autonomous solutions in occupational safety platforms has allowed companies to reduce workplace accidents by up to 30%, this has been possible thanks to the potential of AI to interpret and analyze risk patterns immediately and anticipate dangerous situations before they occur, in the same way AI not only optimizes physical safety, but also but also favors a transformation in organizational culture, encouraging greater proactivity in strategic choice and making it easier for the workforce to focus on tasks of greater relevance within a safer and healthier environment.

Keywords: artificial intelligence, automation, worker well-being, operational efficiency, future of work

El Impacto Global de la IA en la Seguridad en el Trabajo, Oportunidades y Desafíos para el Futuro del Trabajo

RESUMEN

Introducción: La llegada de la tecnología, a lo largo de los años, ha tenido un avance muy significativo, tanto así que está transformando el entorno laboral a un ritmo acelerado, generando tanto entusiasmo como preocupación en empresas, trabajadores y gobiernos de todo el planeta. La implementación de procesos automatizados, la optimización operativa y el potencial de las plataformas inteligentes para aprender y tomar decisiones sin intervención humana están revolucionando industrias enteras, desde la fabricación hasta los servicios, la atención médica y la educación. Sin embargo, este avance tecnológico presenta un escenario complejo: si bien la IA promete mejorar la productividad, crear nuevos empleos y elevar la calidad del trabajo, también plantea desafíos significativos, como el desplazamiento laboral, la necesidad de recapacitación y el aumento de la desigualdad laboral. Examinar el uso de aplicaciones de tecnología inteligente en la mitigación de muertes sindicales, el fortalecimiento del bienestar físico y emocional del personal y la optimización de los procesos de seguridad en diferentes sectores **Metodología:** La metodología adoptada consiste en una rigurosa revisión de la literatura que abarca un período documental de cinco años atrás. Se consultarán fuentes documentales fiables utilizando palabras clave relevantes tanto en español como en otros idiomas para asegurar una visión amplia e internacionalizada del tema. **Resultados:** El despliegue de soluciones autónomas en plataformas de seguridad ocupacional ha permitido a las empresas reducir los accidentes laborales hasta en un 30%, esto ha sido posible gracias al potencial de la IA para interpretar y analizar patrones de riesgo de manera inmediata y anticiparse a situaciones peligrosas antes de que ocurran, de igual manera la IA no solo optimiza la seguridad física, sino que también favorece una transformación en la cultura organizacional, fomentando una mayor proactividad en la elección estratégica y facilitando que la fuerza laboral se concentre en tareas de mayor relevancia dentro de un entorno más seguro y saludable.

Palabras clave: inteligencia artificial**,** automatización, bienestar de los trabajadores, eficiencia operativa, futuro del trabajo

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INTRODUCTION

Smart technologies are generating a profound and accelerated change in occupational safety at a global level, opening a range of opportunities and challenges for the future of work. Its ability to automate demanding tasks, process large amounts of data for real-time analysis and anticipate risks, optimize protection and take care of integrity in workspaces, allowing the prevention of work accidents, the optimization of processes and the creation of reliable and efficient environments. More and more companies and human resources departments are adopting AI-based solutions, from cobots and smart devices, as well as control and projective evaluation systems, which are favorable to the protection of employees and in the same way expand employment opportunities for the elderly or people with disabilities.

However, this technological advancement also involves significant risks and challenges. These include the displacement of jobs due to automation, the intensification of tasks, the need for continuous training and the emergence of new psychosocial and ethical challenges. 36% of workers fear that their job will be replaced by AI and 86% recognize that they must acquire and develop new skills that allow them to face this changing environment.

In this scenario of constant change, it is essential to study the consequences of how cognitive technology is influencing the protection and stability of employment worldwide, identifying both the advantages and the threats it represents with the aim of enriching the living conditions of employees and ensuring the permanence of companies over time. This article explores how AI is redefining traditional approaches to labour protection, the potential benefits it offers and the challenges it poses for the future of employment on a global scale.

Background

From its origins in the 1950s, smart technology has undergone a remarkable development process, when systems were based on simple rules, to become a transversal technology that impacts all productive sectors and redefines safety at work globally. In its beginnings, AI was mainly applied in automation and monitoring tasks, such as pioneering surveillance and management platforms during the 1970s, which laid the foundations for its integration into industrial and labor environments.

Over the last few decades, digitalization and the progress of AI have driven the generation of technological tools, capable of analyzing massive data instantaneously, anticipating risks and optimizing the administration of occupational safety systems. Leading companies in productive fields such as infrastructure, manufacturing and energy have implemented AI-based solutions – such as smart sensors, drones and predictive systems – that have proven to significantly reduce accidents and strengthen decision-making capacity in terms of prevention. For example, companies such as Siemens and Bechtel have reported decreases of up to 40% in workplace incidents following the adoption of smart technologies.

Despite this, integrating AI into occupational safety is not exempt from complications and challenges. Cultural barriers and continuous learning requirements, ethical considerations in the processing of information are key issues that agencies must address in order to safeguard the appropriate and efficient use of these digital solutions. In addition, AI is transforming the labour market, not only by replacing repetitive tasks, but also by creating new roles and skills, for which it requires continuous training and the acquisition of skills by staff and the adaptation of public and business policies.

In this way, technology takes center stage as a fundamental catalyst for the evolution of occupational safety, offering opportunities to anticipate and mitigate risks, but also posing challenges in terms of inclusion, training and sustainability of employment in the digital age, it is worth noting that the incorporation and use of artificial intelligence for the protection of workspaces applied as a result of a technological evolution that has transformed risk management into the workplace. Traditionally, accident prevention relied on reactive methods and human expertise, limiting the ability to anticipate hazards and respond efficiently to critical situations. However, the advent of cutting-edge tools such as big data, the network of interconnected devices, and AI has allowed companies to collect, analyze, and use real-time information on a large scale to find risk correlation and anticipate incidents.

Over the past decade, leading companies in the industrial, energy, and construction sectors have adopted AI-based solutions to monitor working conditions, automate hazard detection, and customize risk prevention to each worker's needs. Examples such as Siemens, Shell and BP demonstrate how AI, combined with intelligent sensors and predictive analytics, has managed to achieve a reduction in

workplace accidents with a percentage between 20% and 40%, also optimizing operating costs and reinforcing commitment to internal safety.

The progress of AI has made it possible to move from reactive models to predictive and adaptive systems, where continuous monitoring, processing data from historical operations and automating risk assessment processes have become common practices in organizations with an innovative approach. In the civil works industry, they show how artificial intelligence can anticipate dangerous situations, send immediate alerts and personalize the protection of workers in highly dangerous environments.

This background shows that the successful fusion of AI with occupational safety protocols not only reduces the accident rate, but also drives a cultural and organizational transformation towards proactive prevention, informed decision-making processes and the development of safer and more efficient work environments

METHODOLOGY

This thoughtful article was developed through an exhaustive systematic review of international documentation. Various reliable sources were consulted, including sites, specialized journals, the generation of digital libraries such as Google Scholar, SciELO and Apache Cassandra as well as institutional repositories.

During the search process, strategic keywords such as Artificial Intelligence, Automation, Worker Well-being, Operational Efficiency, Future of Work were defined, which were essential to collect relevant information on the topic to be discussed.

To broaden news coverage and access a greater volume of data relevant to the study, a language combination was used, including Spanish, English. The scientific papers found in English were translated to ensure an accurate interpretation of the collected content.

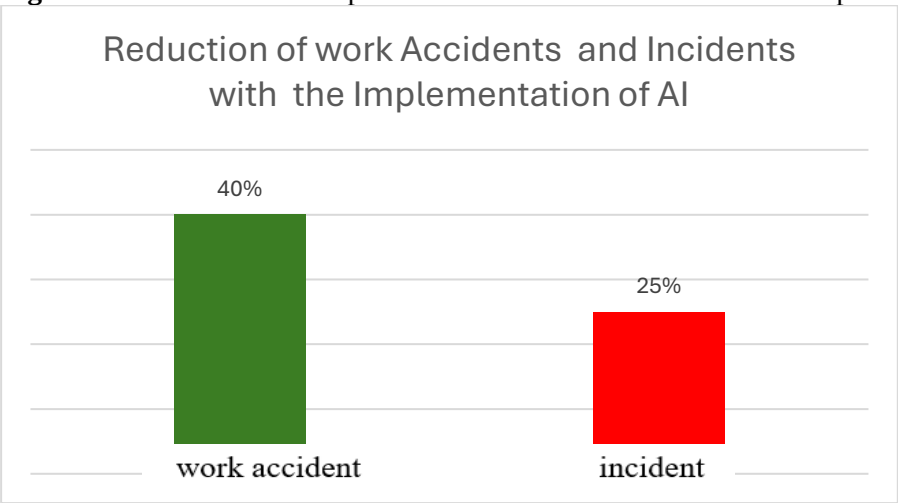
This thoughtful methodological approach of the paper allows us to gain insight into the effect that AI has internationally on job safety, opportunities and challenges for the future of work.

RESULTS AND DISCUSSION

Intelligent systems are revolutionizing safe conditions at work by enabling the identification and proactive prevention of risks through the massive study of information in real time. Recognized companies such as Turner Construction have implemented predictive algorithms that analyze historical

data and current conditions in workplaces, managing to reduce their rates of workplace accidents and 25% of incidents. These systems can detect risk patterns that might go unnoticed by the human eye and generate early warnings, allowing supervisors to anticipate dangerous situations.

Figure. 1 Reduction of Workplace Accidents and Incidents with AI Implementation



Source: Pabon, H. (2025)

This tool is also supported by smart sensors and analysis platforms that continuously monitor the work environment, identifying anomalies, dangerous conditions or unsafe behaviors. This technology not only contributes to safety but also increases performance and cuts costs related to injuries and downtime, facilitates the personalization of risk prevention, adapting the measures to the particularities of each worker and those of the work environment.

In the field of prevention, tangible achievements are being demonstrated in the minimization of accidents at work and in the optimization of safety policies, consolidating itself as a key tool for the future of safe and efficient work.

Exactly, this automation is not limited to taking care only of the physical well-being of personnel by reducing their direct exposure to risks but also increases performance and reliability in the performance of critical activities. By delegating repetitive and dangerous activities to intelligent systems and robots, human errors are minimized, and constant monitoring of working conditions is ensured. This translates into increased productivity, fewer interruptions due to accidents or incidents, and a more protected and reliable professional space for each of the employees. In addition, it allows workers to concentrate on

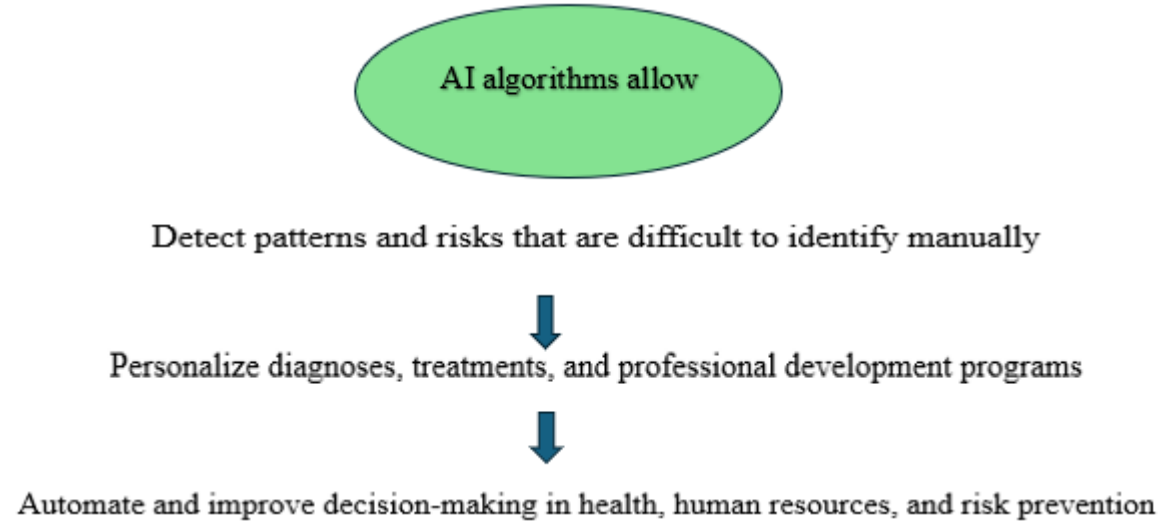
functions with greater added value, favoring their professional development and the sustainable growth of the organization.

Artificial intelligence tools, such as smart sensors and cameras equipped with computer vision algorithms, enable continuous monitoring of the work environment, ensuring compliance with safety regulations and facilitating rapid response to incidents. These technologies use immediate information processing to identify hazardous conditions, unsafe behaviors, or process deviations, allowing organizations to intervene proactively and reduce risks. In addition, AI in these systems minimizes human bias and improves accuracy in incident detection, contributing to safer and more efficient work environments.

This has improved operational efficiency by up to 30%, by optimizing prevention processes, automating the generation of reports and audits, and reducing costs associated with accidents and downtime. Thanks to this advance, companies can detect and address risks with greater speed and accuracy, so that the frequency of incidents decreases and allows a more agile management of resources. On the other hand, the automation of administrative functions results in staff dedicating themselves to planning and decision-making actions, increasing productivity levels and contributing to the sustainability and competitiveness of the organization.

This technological advance is facilitating the personalization of security strategies, adapting preventive measures according to the characteristics of each industry, work environment and even each worker. AI algorithms can analyze individual data, such as health status, skills, and working conditions, to design risk prevention programs tailored to the characteristics of each employee and job

Figure 2. AI algorithms



Source: Pabon, H. (2025)

Personalization also extends to training, as it facilitates individualized training through simulations and virtual environments adapted to the specific risks faced by each worker. Likewise, smart devices such as helmets and sensors are equipped where they monitor environmental conditions and warn employees of imminent dangers, providing personalized protection in real time. In summary, this tool not only strengthens operability and preventive management, but also promotes dynamic safety strategies that adapt to the specific needs of each industry, environment and person, promoting work environments with better safety and well-being standards.

Although it offers clear benefits in reducing workplace accidents, advancing employee health effectiveness and satisfaction, its adoption must overcome significant challenges. One of them is the high initial investment required to obtain, integrate and maintain advanced technologies, which may be inaccessible to emerging companies (SMEs).

Effectiveness is based on the existence of data systems for access and functioning correctly. Organizations that do not have robust data collection and management systems in place may find it difficult to implement solutions. The lack of digital equipment, the lack of training of human resources and the internal rejection of transformation can slow down the implementation of these tools. Therefore, while it has an opportunity to renew job security, it is critical to address these challenges through supportive policies, incentives for digitalization and training strategies that allow companies of all sizes to benefit from its advantages.

There are relevant ethical and social concerns in the application and use of changing technologies in the occupational context, among which are employee privacy, possible bias in algorithms and the management of sensitive data. Privacy is one of the main challenges, as the use of AI involves collecting and analyzing abundant confidential and work information, which requires high security standards and clear policies on the use and access to this data. Leaks or misuse of information could lead to significant risks for both employees and organizations.

Responsible management of sensitive data requires the implementation of ethical frameworks, accountability in operating mechanisms, processing, and review to correct errors or negative impacts on employees. The International Labour Organization (ILO) and organizations such as UNESCO underline the need to establish modern regulations adapted to the digital age, ensuring honesty, fair treatment and protection of privacy in the implementation of AI systems.

Automation and digitalization are generating a substantial change in professional profiles, generating both opportunities in emerging areas and risks of job displacement. This advance has driven the search for technical profiles with skills in software development, data processing, technological projects, while positions of medium qualification and routine tasks are the most susceptible to being automated or digitized

Even though automation may eliminate certain jobs, it is also creating new positions in technology sectors, maintaining automated systems, and managing consumer interaction. This transformation requires workers to be proactive in their professional development and upskilling, as 45% of employees fear losing their jobs due to AI, underscoring the value of the need to continuously learn and reform skills to adjust to current demands in the occupational field.

Continuing education and specialized training have become fundamental pillars to ensure the employability and competitiveness of both workers and companies in the digital age. Online training spaces, micro-training content and electronic credentials facilitate access to knowledge and enable employees to adjust to the constant changes in the professional sector. In this context, investing in training and strengthening a lifelong learning vision are essential tactics to harness digitalization and control its negative effects.

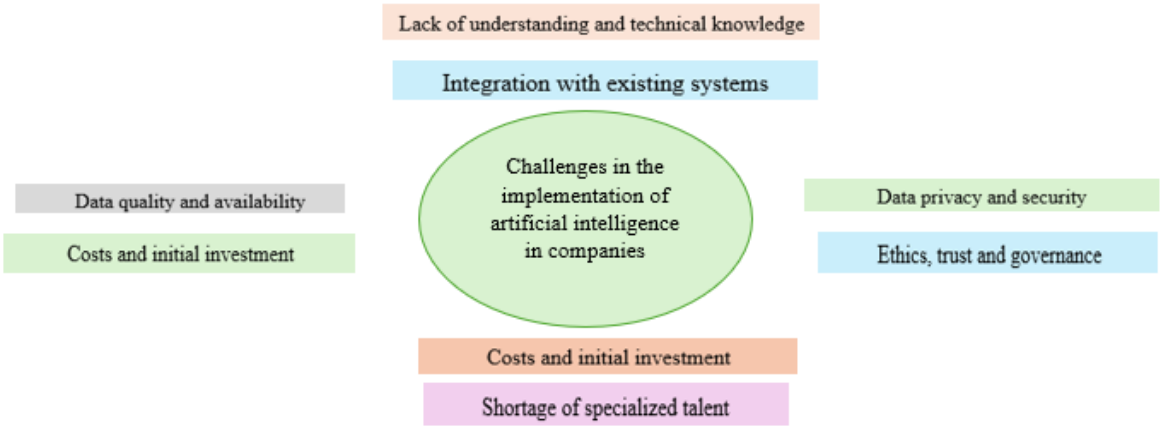
This makes it possible to promote new ways of working, such as teleworking and the management of distributed teams, which poses additional challenges in coordination, administration and occupational safety. While these modalities offer advantages such as greater flexibility, cost reduction and access to global talent, they also bring with them specific challenges such as the lack of face-to-face supervision which makes it difficult to have direct control over working conditions, which can increase workload, psychological distress and compromise the preventive action of security departments. Remote work can increase loneliness, anxiety, and the lack of separation between professional and private, affecting the mental balance of employees. Many remote employees use non-functional spaces, which impact bodily health, such as muscle aches, eye strain, and burnout. Remote work can expose employees to greater risks of cyberattacks and cyber threats, as they do not always have secure networks or robust information protection protocols in place. AI facilitates the coordination and monitoring of distributed teams through tools that organize tasks, analyze performance, and personalize training and well-being, but it requires resilient management strategies adapted to the new digital reality.

Artificial intelligence symbolizes a disruptive opportunity aimed at optimizing occupational safety criteria, by allowing proactive action in the anticipation of risks thanks to the instantaneous processing of information, the automation of dangerous tasks and the personalization of preventive strategies. Companies from various sectors are already using systems to ensure that safety guidelines are followed, identify risk patterns and significantly minimize the rate of unwanted accident events, in addition, revolutionizing the development and training of personnel through simulations and adapted content, which improves knowledge retention and preparation for critical situations.

However, maximizing these benefits requires a balanced strategy that integrates innovative technology, continuous training, and inclusive policies. The incorporation of technological methods in safety within the occupational field introduces barriers such as the investment required for its implementation, the importance of having quality data, the safeguarding of personal data, and the ethical management of information8. Likewise, it is essential to invest in training and adaptation of workers to avoid labor displacement and ensure that all groups, including the most vulnerable, benefit from these advances, which are capable of profoundly changing the parameters of defense and well-being in the union environment, but their positive impact will only be sustainable if it is accompanied by strategies that

promote human-machine collaboration. the permanent updating of skills and the creation of fair and accessible work environments for all.

Figure 3. Challenges in the implementation of artificial intelligence in companies



Source: Pabon, H. (2025)

CONCLUSIONS

Delegating hazardous actions to automated systems gives staff the ability to contribute in more meaningful complex areas, freeing up time for more impactful and creative activities, contributing to safer and healthier work environments. In addition, global productivity is expected to increase, with annual growth estimates of between 0.2% and 3.3% thanks to the adoption of AI.

According to the World Economic Forum, it estimates that by 2025 it will have displaced 75 million jobs, but created 133 million new ones, which is a net gain, although with significant transition challenges for the affected workers, around 50% of employees will need to develop new skills to adjust to the transformations, it represents a historic opportunity to improve occupational integrity, Productive capacity and the value of work, however, demand detailed control over critical aspects of job displacement, inequality and ethical dilemmas. The future of work will depend on the willingness of employees to evolve and the implementation of policies that guarantee equitable and protected change for the workforce. On the other hand, gaps in digital infrastructure, access to the internet and electricity, and the lack of technological skills are barriers that limit the use of artificial intelligence AI.

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