Rapport de veille n° 74

BIM

31/08/2025

Objectif : *L'utilisation du BIM en phase de conception et de ses potentiels applications pour la prévention des risques*

La validation des informations fournies (exactitude, fiabilité, pertinence par rapport aux principes de prévention, etc.) est du ressort des auteurs des articles signalés dans la veille. Les informations ne sont pas le reflet de la position de l'INRS.

Les liens mentionnés dans le bulletin donnent accès aux documents sous réserve d'un abonnement à la ressource.

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Proposal for temporary safety facilities for fall protection using 4DBIM to meet OSHA standards

D Salameh, L Saoud - International Journal of BIM and Engineering Science, vol. 8, no. 1, 2024, pp. 58-68
DOI: https://doi.org/10.54216/IJBES.080105

Temporary Safety Facilities (TSFs) constitute a vital support infrastructure ensuring the safety of workers throughout construction operations, with the overarching goal of averting accidents onsite; However, the schedule and location of installation and dismantling of technical support facilities is still based on work experience, and is often omitted from official drawings or documents. This leads to thousands of accidents in the construction sector, especially in small and midsize construction enterprises construction firms due to many limiting factors; Therefore, this study proposes automatic workspace planning for temporary safety facilities (in our case guardrails for fall protection) based on construction activities, which is a structured approach for SMEs working in construction to practice Occupational Health and Safety (OHSA). By employing Building Information Modeling (BIM), safety facilities can be simulated and visually incorporated into the assigned workspace. Utilizing 4D-BIM, the devised system facilitated the installation of temporary safety features, such as fall protection railings, which underwent validation via a case study involving a mall project. The results indicated that integrating temporary safety facilities with the model enhances comprehension of safety protocols throughout project execution. Additionally, temporary facility workspace planning provides an affordable approach that stimulates safety practices; Thus, significantly enhancing the management effectiveness of construction safety measures.

Global research activities, trend and future research of OSH technologies in the construction industry

FL Guribie, JN Agumba, RG Muthelo - Safety Science, November 2025, Volume 191
DOI : https://doi.org/10.1016/j.ssci.2025.106979

The study mapped the global research activities and trend of occupational safety and health (OSH) technologies in the construction industry, by deploying the quantitative science mapping method to analyze the bibliometric data of 178 articles. From our review, five (5) general OSH technologies were identified – Immersive Reality, Wearable technology, Artificial intelligence, Building Information Modelling and Unmanned aerial vehicles. The current research pattern of these technologies are classified under (4) major themes – 1) General Applications of OSH technologies; 2) Technological and Performance requirements of OSH technologies; 3) Experimentations and field applications of OSH technologies and 4) Adoption of OSH technologies in the construction industry. A general classification framework of future research needs of OSH technologies is proposed. This includes − 1) Resiliency in the applications of OSH technologies; 2) Smart technologies and design system; 3) Interventions for mitigating the risk of the operations of OSH technologies; 4) The synergy of integrating OSH technologies such as BIM and XR. The study adds to the general understanding of OSH as a scholarly domain by providing a comprehensive picture of the evolution, structure, and interrelationships of published research articles on OSH technologies in the construction industry.

Investigating the Impact of Artificial Intelligence and Digital Technologies on Improving Safety in Construction Environments

M Samadder, AK Roy, A Ray, S Rakshit, AM Kar - Construction Environments. International Journal of Engineering and Information Management, 1(3), 44-54
DOI: 10.52756/ijeim.2025.v01.i03.004

There are remarkably challenging issues attributed to the construction industry as far as workplace safety is concerned, since it is a complex, dynamic and risky field. Over the past few years, Artificial Intelligence (AI) and digital technologies have become the probable way to handle these safety issues of the past and facilitate

proactive hazard detection, real-time monitoring, and predictive risk management. The review examines the existing reality, potential, and constraints of digital technologies and AI in modifying the construction environment into a more harmonious environment of safety. A well-organized overview of the recent publications shows that there is an increasing use of technologies, including machine learning, computer vision, robotics, knowledge based systems, the Internet of Things (IoT), Building Information Modelling (BIM), wearable sensors, and drones in hazards detection, safety behaviour, and incident prevention. Nevertheless, the broad swelling of such technologies is minimal since the technological division or split, lack of interoperability, organizational resistance, skills gap of the workforce, and empirical grounding are among the factors affecting the adoption of such technologies. Moreover, combinations of digital tools in integrated approaches to managing safety are not well explored, and long-term reviews of these interventions are not available. The review identifies the missing research as well as offers directions that new research ought to take to come up with new types of digital safety solutions that are scalable, interconnected, and human-friendly.

A Study On Risk Management In Construction Projects

M Kumar, D Singh, D Negi - International Journal of Environmental Sciences, 2025, vol. 11, n° 17S
DOI : 10.52756/ijeim.2025.v01.i03.004

Risk management is a critical aspect of construction project management, ensuring the successful completion of projects within scope, budget, and timeline. Construction projects are inherently complex, involving multiple stakeholders, uncertain site conditions, financial constraints, and regulatory challenges. This review explores the key principles, methodologies, and tools used in risk management for construction projects. It discusses common risks such as cost overruns, delays, safety hazards, environmental concerns, and contractual disputes. Furthermore, the study highlights risk identification, assessment, mitigation strategies, and the role of technology, including Building Information Modeling (BIM) and artificial intelligence, in improving risk management efficiency. By analyzing case studies and best practices, this paper emphasizes the importance of proactive risk management in enhancing project performance, sustainability, and resilience in the construction industry.

Leveraging Technology to Improve Safety on Construction Sites [PDF]

N Jenuwa, N Yusop, S Ali, WNW Ismail, SSM Isa - Jurnal Intelek, 2025, Volume 20, Issue 2
DOI: http://10.24191/ji.v20i2.6133

The construction industry is consistently challenged by safety risks stemming from its dynamic and hazardous working environment. Common dangers such as falls, equipment-related injuries, electrical accidents, and on-site collisions necessitate the continuous improvement of safety management practices. This study explores the adoption of advanced safety technologies to mitigate these risks and enhance on-site safety performance. Utilizing a quantitative research approach, structured surveys were distributed to 274 contractors (Grades G4 to G7) operating in Perak, Malaysia—an area with a notably high incidence of construction-related accidents and fatalities. The study focuses on the implementation of technologies such as wearable devices, drones, IoT-based monitoring systems, Building Information Modelling (BIM), and augmented reality (AR). Findings indicate a positive impact of these technologies on improving safety outcomes, including real-time hazard identification and enhanced compliance with safety regulations. However, several barriers to adoption were identified including high costs, insufficient technical knowledge, organizational resistance, and infrastructure imitations. Statistical analysis conducted using SPSS demonstrated strong correlations between the use of specific technologies and a decrease in reported safety incidents. The study recommends increasing access to technical training, promoting affordable innovations, and developing supportive regulatory frameworks to accelerate the integration of safety technologies in the construction sector. The research underscores the critical role of technology in fostering a safer, smarter, and more resilient construction industry.

Multidimensional fall risk assessment for the real-time monitoring of construction site Worker safety

MY Cheng, QT Vu, LK Yang - International Journal of Construction Management, 2025, 1-31

DOI : https://doi.org/10.1080/15623599.2025.2546018

The construction industry has a significantly higher risk of fatal accidents than other sectors. According to the 2024 Taiwan Safety and Health Administration report, falls account for 60.04% of all construction-related incidents. These accidents often result from working at heights, particularly on platforms or near unprotected openings. While interventions focus on physical safety, they often overlook worker's mental and physiological conditions. Factors such as mental fatigue, reduced concentration, and excessive heat exposure significantly increase accident risk. This study develops a fall risk assessment model tailored to construction, integrating three key factors: area risk, psychological fatigue, and physiological stress. Area risk is determined using historical accident data and Building Information Modeling (BIM) to identify high-risk zones. Psychological fatigue is assessed through brainwave analysis using Fourier transform, while physiological stress is evaluated based on the US National Institute for Occupational Safety and Health (NIOSH) heat stress guidelines, incorporating Wet Bulb Globe Temperature (WBGT) and heart rate data. By combining these dimensions, the model generates a real-time fall risk matrix, allowing proactive risk management and reducing fall accidents on construction sites.

Integrating AR and 4D-BIM for dynamic hazard management in construction projects

MJ Zoleykani, H Abbasianjahromi - International Journal of Construction Management, 2025, 1-25

DOI : https://doi.org/10.1080/15623599.2025.2547837

This research introduces an innovative approach to construction safety by leveraging immersive technologies. It addresses the challenge of evolving hazards throughout a project's lifecycle, with some hazards diminishing upon completion while new ones emerge. The proposed framework integrates Augmented Reality (AR), 4-Dimensional Building Information Modeling (4D-BIM), and project scheduling to manage these dynamic changes by automatically identifying fall-related hazards associated with structural elements in the BIM model, incorporating the project schedule, and providing safety information through AR, excluding external areas and other hazards like fire or electrocution. The framework includes two main modules: the Rule Checking and Simulation Module and the AR Module. The first module uses the Rule Module and BIM Module to identify hazardous areas and plan safety inspections by employing 4D-BIM. Safety information and tasks are updated in the project schedule, and QR codes are generated for hazardous areas. The AR Module provides safety information to inspectors and workers through QR code scans, presenting regulations and equipment need. The results represented that the framework effectively identified hazards and enhanced safety instructions through AR. While the framework was applied to a residential building, this approach could be scaled to other projects like commercial and infrastructural projects for verification.