Rapport de veille n° 72

BIM

30/06/2025

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.

Table des matières

1. Articles scientifiques

Utilization Of Bim Model For Osh Cost Estimation On Low And Medium Rise Building Projects

R Milyardi, C Lesmana, MK Satyana, C Padmanindita… - ASEAN Engineering Journal, 2025, 15(2), pp. 175-182

DOI : https://doi.org/10.11113/aej.v15.22259

The Occupational Safety and Health (OSH) accident in Indonesia has reached its highest level in five years. The development of OSH cost includes the project budget to reduce accidents. Building Information Modeling (BIM) can detect potential causes of accidents prior to the construction starts so that the accident can be reduced. Many utilizations of BIM in OSH focus on planning and prevention rather than on OSH cost estimation. This study aims to conduct OSH cost component estimation using BIM for a building project in Indonesia. Two projects in the planning phase, tower building and warehouse building, are studied. The result indicates BIM utilization contributes to a to a more detailed safety equipment budget compared to the actual case. OSH cost reaches 2.01% from total budgeted project cost for tower building and 0.37% from total budgeted project cost for warehouse building. This shows the potential of estimating the OSH budget using the BIM model to achieve the ideal value of the OSH budget (2.01%–3.70%), particularly for mid-rise buildings.

Automated scheduling method for reducing spatial-temporal conflict safety risks, using ML and BIM [PDF]

H Emamialeagha, A Nazari, A Shafaat, S Shalchian - Journal of Information Technology in Construction ITcon Vol. 30, 2025, pp. 903-923

DOI : 10.36680/j.itcon.2025.037

Construction sites face inherent risks from overlapping activities in confined spaces and require advanced solutions to manage spatial-temporal conflicts. Surpassing previously developed static BIM tools, this study introduces an automated approach that revolutionizes job site safety planning by dynamically assessing conflict risks between evolving workspaces. The method integrates empirical workspace geometry with machine learning—using Support Vector Machine regression to predict worker presence—and BIM-driven dynamic conflict analysis, which reflects real-time changes in workspace sizes and team movements. By generating safety score matrices through pairwise risk assessments, it quantifies conflict types (physical impacts, proximity risks, workflow disruptions) and enables real-time scenario comparisons via Python-based evaluation. Adjustable parameters allow customization for team sizes, workspace allocations, and pandemic-specific adaptations such as social distancing. Case studies show that the system effectively identifies high-risk periods, compares different work sequences, and makes schedules without sacrificing productivity. Unlike earlier clash detection methods that only compared static models, this framework provides actionable safety metrics to proactively respond to conflict risks. Designed for scalability, the presented method manages computational demands in complex projects. This advancement represents a paradigm shift in construction safety, blending predictive analytics with practical adaptability to protect workers and streamline operations.

Modelling risk factors in earthmoving equipment operations on Australian construction sites: a fuzzy DEMATEL approach

N Soltanmohammadlou, CKH Hon, R Drogemuller… - Engineering, Construction and Architectural Management, 2025

DOI : https://doi.org/10.1108/ECAM-02-2025-0240

Despite advancements in safety technologies in the construction industry, such as building information

modelling (BIM), their impact remains limited due to an insufficient understanding of influential areas of risks and their interconnections. Earthmoving equipment (EE) incidents in Australia underscore ongoing safety challenges. This research develops a model of influential risk factors in earthmoving equipment operations (EEOs) through Rasmussen's (1997) risk management framework (RMF), uncovering interrelationships to enhance risk identification and support the application of appropriate solutions aligned with the specific system level where each risk originates and evolves. Thus, it paves the way for comprehensive vertical, horizontal and end-to-end integration of technological and managerial solutions across all layers of safety management. A literature review identified seven main categories and 52 sub-risk factors, which were further refined through expert validation via 32 semi-structured interviews and alignment with relevant codes of practice and regulations. The research also applies fuzzy decision-making trial and evaluation laboratory (FDEMATEL) for the first time in the Australian construction context to analyse cause-and-effect relationships of EEO risk factors within Rasmussen's (1997) framework. This methodology also integrates statistical validation techniques, including corrected item-total correlation and split-half methods within the FDEMATEL framework and sensitivity analysis to ensure response consistency, robustness and reliability, ultimately identifying critical areas for targeted interventions in EEOs' safety management. The most influential risk factors across the risk management framework were categorized into cause-and-effect groups, identifying influential factors of EEO incidents. This led to the impact relations map (IRM), classifying factors by causal and effect-driven roles, making influential factors the primary focus for technological advancements and managerial strategies.

Improving Construction Safety Record Management through a BIM-Based Decision Support System

A Tariq, RW Azfar, H Zahoor, B Ali, H Tariq - Journal of Legal Affairs and Dispute Resolution in Engineering and Construction, 2025, Volume 17, Issue 4

DOI : https://doi.org/10.1061/JLADAH.LADR-1070

This paper seeks to propose a building information modeling (BIM)-based decision support system (DSS) that can improve construction safety record management by visualization of safety records within the BIM environment and by creating a central repository of safety management incidents; both accidents and near-misses. For this purpose, a detailed literature review was conducted to determine research gaps in traditional safety management practices. Later, the identified loopholes were made the key focus while developing the safety record management software (SRMS) and its utility test was conducted on an under-construction school site where the site workers were given SRMS training. The incidents reported (23 near-misses and 4 minor accidents) by the workers were recorded in SRMS based on their criticality level. The SRMS prototype generated both hard-copy reports and saved data automatically to the central repository of all safety incidents on-site to make it accessible for further analysis of safety incidents at the site. Interviews of the field experts were also conducted to gauge the applicability of this prototype and its potential vis-à-vis the identified research gap. The study finds that loopholes in traditional safety management can be mitigated using the given SRMS prototype that will enable in the creation of a precedence data repository through digital storing, organization, and visualization of safety information. It can also sensitize safety management within the construction hierarchy as indicated from the survey for health and safety (H&S) managers who reviewed the success of the prototype on the site. This study aims to achieve a solution to the overriding concerns halting the proper implementation of safety mechanisms through organized management, and digitization, and by building an easy-to-use integrated repository for safety record keeping. To address the issues, this research utilizes information and computer technology (ICT) that can work as a DSS. It can minimize information gaps, safety lags, and cost margins.

2. Conférence / ouvrage / thèse

Transition numérique dans la construction : perspectives comparatives des politiques publiques de la France et du Québec pour l'adoption du BIM

V Lerognon, EA Poirier, E Hochscheid, G Halin - 92e Congrès de l'Acfas, Association canadienne-française pour l'avancement des sciences, May 2025, Montréal (Québec), France.

HAL-id : hal-05108282

La modélisation des données du bâtiment (BIM) est un processus numérique qui permet la création, la gestion et le partage de données structurées tout au long du cycle de vie des projets de construction, favorisant ainsi l'efficacité, la collaboration et la durabilité. Ces dernières années, plusieurs gouvernements ont mis en œuvre des plans d'action nationaux pour soutenir l'adoption du BIM, mais avec des calendriers et des stratégies différents. La France a d'abord lancé le Plan de Transformation Numérique du Bâtiment puis le Plan BIM, tandis que le Québec a introduit sa Feuille de route gouvernementale pour la modélisation des données des infrastructures (2021-2026). Bien que la littérature ait examiné les défis liés à l'adoption du BIM, peu d'études ont exploré l'impact de ces politiques et la dynamique de diffusion qu'elles ont générée. Cette étude compare les politiques BIM en France et au Québec, deux régions dotées de structures de gouvernance différentes dans le domaine de la construction et de l'innovation numérique. Grâce à un examen approfondi de la littérature récente et des documents politiques, nous analysons les objectifs, les stratégies de mise en œuvre et les défis associés aux politiques BIM.

A Review of Benefits Using Artificial Intelligence in Construction

M Zohourian, A Pamidimukkala, S Kermanshachi – In International Conference on Transportation and Development 2025, 2025

DOI : https://doi.org/10.1061/9780784486191.032

Artificial intelligence (AI) is a powerful technology that has facilitated the growth of many industries over the past several decades. In the construction industry, however, as in many other industries, challenges such as cost, time, and lack of knowledge have prevented it from reaching its full potential. Numerous studies have been published on this topic, but none of them have extensively reviewed all the benefits that AI offers. The objective of this study, therefore, is to identify the advantages of using AI technologies in the construction industry. To achieve this objective, a total of 150 papers were comprehensively reviewed, and 41 benefits were identified for 5 technologies: the Internet of Things (IoT), machine learning (ML), digital twins (DT), building information models (BIM), and drones. The findings from this study will help practitioners, project managers, and owners of construction companies utilize the benefits of integrating AI into their projects to enhance worker safety, productivity, cost and time efficiency, and sustainability.

Preventing Accidents: A Hybrid Approach to Workplace Safety Prediction and Risk Management

U Bhimavarapu – In Cases on AI Innovations in Occupational Health and Safety, 2025, pp. 255-272

DOI : 10.4018/979-8-3693-9301-7.ch011

Prevention and prediction of workplace safety are critical components of reducing accidents and improving overall employee well-being. In this study, we explore advanced techniques for predicting and preventing workplace accidents using machine learning and optimization algorithms. We focus on the application of Particle Swarm Optimization (PSO) and Remora Optimization for feature extraction and selection, respectively, to identify the most relevant factors contributing to accidents. A Convolutional Neural Network (CNN) is then employed to predict accident severity, fatality risks, and injury outcomes based on extracted features. The dataset used in this study includes various workplace accident records, including accident types, industry

sectors, safety compliance levels, and injury data. The results demonstrate that our approach effectively identifies critical factors influencing workplace safety, allowing for targeted interventions and improved predictive accuracy.

Co-design and Development of Building Information Modelling for Work Health and Safety Design, Construction and Management Industry Guidelines

K London, Z Pablo – In Digital Transformation in Architecture and Construction, 2025

DOI: 10.5772/intechopen.1008418

The construction industry has one of the highest high fatality and injury rates globally. Building Information Modelling (BIM) as an enabling technology can significantly eliminate and mitigate risks and improve work health and safety (WHS) management. Adoption is inconsistent, although various guidelines and legislation have been developed to reduce incidents and injuries in the workplace. Our literature review indicates that the UK, Singapore, Hong Kong, US, Germany, Spain and Finland public and private sectors are relatively advanced in the development of BIM technology. The US has been a significant contributor through its collaborative links with the UK, Australia, South Korea, Germany and Spain. In contrast, the integration of BIM and WHS management is less advanced. Australia, the site of this study has lacked research that evaluates WHS management in a BIM-environment. To increase BIM-WHS management integration across the industry, a government, industry and academic collaboration in Australia was undertaken, resulting in the development of comprehensive evidence-based guidelines comprising four key components: (1) Developing Information Requirements, (2) BIM for WHS Best Practice, (3) Procurement, Tendering and Supply Chain Monitoring and (4) Developing Project Information Requirements. The comprehensive iterative collaborative process that underpinned the development and distribution of the guidelines is described.

Occupational Safety and Health in Construction Industry (Management) 2017: Awareness among Construction Stakeholders [PDF]

MS Sazali, HLT Ariffin, NI Mohd, MB Bahrodin… - In IOP Conference Series: Earth and Environmental Science, 2025, 16 p.

DOI : doi:10.1088/1755-1315/1509/1/012009

Prevention through Design (PtD) is one the practices to reduce the risk of construction accidents. The objective of PtD is to ensure that safety and health concerns are considered as early as in the design stage, involving all stakeholders from client to contractor. In Malaysia, the PtD concept is known as OSHCI(M). However, previous studies have shown that not all stakeholders willingly cooperate in the application of the PtD concept, resulting in unsuccessful risk reduction. Some stakeholders still believe the conventional method works well because the application of PtD will only cost money and time. Therefore, this study was carried out to determine the level of awareness among construction stakeholders in OSHCI(M) implementation. A quantitative approach was adopted for this research, utilizing a survey design. This study highlights the potential of survey-based research in capturing stakeholder awareness and perceptions, providing valuable insights into the implementation of safety practices within the construction sector. A structured questionnaire served as the primary instrument for data collection, focusing on the perceptions of seven (7) key stakeholders: client, architect, quantity surveyor, C&S engineer, M&E engineer, Safety and Health (concept, duties, principles, and risk reduction) with statements evaluated using a Likert scale. The findings indicate that all construction stakeholders are either aware or highly aware of OSHCI(M) as part of the PtD concept. This demonstrates that the stakeholders in the Malaysian construction industry have a strong level of awareness and understanding of OSHCI(M), highlighting the effectiveness of efforts to expose them to this safety and health initiative.

Challenges and Benefits of Using BIM Technologies to Improve Construction Safety: An Exploratory Case Study [PDF]

A Alotaibi, JA Gambatese - Proc. of the 23rd CIB World Building Congress, 19th – 23rd May 2025, Purdue University, West Lafayette, USA

https://docs.lib.purdue.edu/cib-conferences

Building Information Modeling (BIM) continues to experience rapid growth in the construction industry. BIM changes how design and construction can be approached by using algorithms that automatically assess various elements of project designs and construction, including potential safety risk. Compared with other approaches which evaluate safety risk during the design and execution phases, BIM models can help reduce the number of workers and resources used to ensure proper safety management. This paper presents a research study to investigate BIM technologies (e.g., Robotic Total Station and Navisworks) commonly implemented and any challenges and needed improvements to benefit construction safety. The research consisted of an explanatory investigation of a case study to gather comprehensive data on BIM implementation. The case study project was a life sciences building project in Portland, Oregon, USA, where the project personnel used BIM technologies to visualize the project and simulate environmental conditions for coordination to ensure efficient installation, stay on schedule, and identify potential hazards. The study revealed major challenges, including: (1) familiarity with BIM expectations, (2) financial challenges, and (3) turnover to the owner. The research contributions and outcomes benefit construction practitioners when training engineers to use BIM to predict potential hazards. The research also provides future recommendations on the use of BIM for construction safety management and practices.

Towards a Healthier Workforce in the Construction Industry [PDF]

TL Nkosi, FA Emuze, A Windapo - Proc. of the 23rd CIB World Building Congress, 19th – 23rd May 2025, Purdue University, West Lafayette, USA

https://docs.lib.purdue.edu/cib-conferences

A sustainable built environment aligns with the United Nations Sustainable Development Goal 3 (Good Health and Well-Being) by enhancing workforce health and welfare in the construction industry. This study employs a systematic literature review methodology to identify best practices, technologies, and policies contributing to achieving SDG 3. The findings reveal that integrating technologies such as Building Information Modelling (BIM), wearable sensors, and prefabrication techniques improves worker safety and mental health while reducing physical hazards. Furthermore, comprehensive well-being programs, ethical planning, and stakeholder collaboration can significantly enhance worker welfare and productivity. The study highlights the challenges in implementing health and welfare practices in construction, including cost constraints and fragmented regulations, and provides actionable recommendations for overcoming these barriers. These insights underscore the importance of prioritizing worker health and safety to achieve SDG 3.