Rapport de veille n° 59

BIM

31/05/2024

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. Références anglophones

1.1 Articles scientifiques

An Evaluation Study of the Impact of Occupational Health and Safety on Productivity in Saudi Arabia Construction Industry [PDF]

Vision 2030's transformative drive in Saudi Arabia has ignited a construction boom. However, this sector also holds the unfortunate distinction of boasting the highest workplace injury rates. This study delves into the critical link between health and safety (H&S) practices and construction productivity within the Kingdom. It aims to illuminate the significant impact of robust H&S protocols on project productivity, ultimately promoting their adoption across the industry. By employing a mixed-methods approach, 36 key H&S factors are identified and categorised. A comprehensive questionnaire survey, distributed across diverse construction sites throughout Saudi Arabia, garnered insights from 108 industry professionals. Total Importance Index Impact (T.I.I.I.) analysis was then utilised to extract the most impactful factors influencing productivity. The findings unequivocally demonstrate the vital role of H&S in construction success. Companies can unlock significant productivity gains by prioritising improved working conditions and implementing effective H&S management programs. This research offers a compelling case for prioritising worker well-being as a cornerstone for a thriving construction sector within Saudi Arabia.

A Review of Data Mining Strategies by Data Type, with a Focus on Construction Processes and Health and Safety Management [PDF]

Increasingly, information technology facilitates the storage and management of data useful for risk analysis and event prediction. Studies on data extraction related to occupational health and safety are increasingly available; however, due to its variability, the construction sector warrants special attention. This review is conducted under the research programmes of the National Institute for Occupational Accident Insurance (Inail). Objectives: The research question focuses on identifying which data mining (DM) methods, among supervised, unsupervised, and others, are most appropriate to be applied to certain investigation objectives, types, and sources of data, as defined by the authors. Methods: Scopus and ProQuest were the main sources from which we extracted studies in the field of construction, published between 2014 and 2023. The eligibility criteria applied in the selection of studies, were based on the Preferred Reporting Items for Systematic Review and meta-analysis (PRISMA). For exploratory purposes, we applied hierarchical clustering, while for in-depth analysis, we use principal component analysis (PCA) and meta-analysis. Results: The search strategy based on the PRISMA eligibility criteria, provided us with 61 out of 2,234 potential articles, 202 observation, 91 methodologies, 4 survey purposes, 3 data sources, 7 data types, and 3 resource type. Cluster analysis and PCA organized the information included in the paper dataset into two dimensions and labels: "supervised methods, institutional dataset, and predictive and classificatory purposes" (correlation $0.97 \div 8.18E-01$; p-value $7.67E-55 \div 1.28E-22$) and the second, Dim2 "not-supervised methods; project, simulation, literature, text data; monitoring, decision-making processes; machinery and environment" (corr. $0.84 \div 0.47$; p-value $5.79E-25 \div 3.59E-06$). We answered the research question regarding which method, among supervised, unsupervised, or other, is most suitable for application to data in the construction industry. Conclusions: The meta-analysis provided an overall estimate of the better effectiveness of supervised methods (Odds Ratio = 0.71, Confidence Interval $0.53 \div 0.96$) compared to not-supervised methods.

How Can Safety Contribute to Working Conditions in the Construction Industry? A Conceptual Framework [PDF]

Studies have demonstrated the critical role that safety plays in preserving favourable working conditions in the construction industry, which is necessary to accomplish goals. The aim of this research was to inform stakeholders in the construction industry in developing nations about the value of safety and possible strategies for influencing their opinions regarding safety protocols. The importance of safety to the construction sector, which is crucial to the advancement of the country, has also been emphasized. However, due to a lack of adequate safety understanding among stakeholders in the construction sector, the construction industry is characterized by a great deal of instability and hazard. To determine what factors, affect productive working conditions in the construction production, this study examined safety. A conceptual framework for safe working conditions in the construction sector was developed by considering several aspects, including the person dimension, environment factor, safety behaviour, organization features, technology, and incentives. It is now imperative to bring in these dimensions to improve the safe working conditions in the construction industry, particularly in the developing countries. By putting these safety factors into practice, the construction industry can reduce safety risks, lower the number of accidents and fatalities, cut expenses related to subpar safety performance, safeguard the reputation of construction companies, boost employee morale and satisfaction with their work, enhanced employee retention, reduced absenteeism, and enhanced sustainability goals. Additionally, the proposed conceptual framework is assured to be new and to be widely accepted in the developing nations. Based on this assumption the conceptual framework is designed.

Investigating Optimism about and Impediments to BIM Implementation in Construction Safety Management: Asian Perspectives

This paper unveils insights from a thorough investigation into implementing building information modeling (BIM) into construction safety management practices across Asian countries. The study involved 192 randomly surveyed respondents from Japan, the Philippines, Thailand, China, Singapore, Myanmar, and Indonesia to assess their utilization of BIM and its application in construction safety planning and implementation. The questionnaire revealed that 61% of respondents had used BIM; however, only 20% of this subset had used BIM to enhance construction safety. While an encouraging 90% of respondents expressed a positive opinion of BIM as a potential tool for mitigating construction accidents, qualitative analysis of their remarks unveiled challenges hindering effective implementation. This investigation sheds light on the gap between recognizing BIM's potential in enhancing construction safety and the practical challenges hindering its widespread adoption in the Asian construction industry. The insights from this study can inform policy, education, and industry practices to address the identified barriers and facilitate the successful implementation of BIM in managing safety in construction.

Artificial Intelligence in Occupational Health and Safety Risk Management of Construction, Mining, and Oil and Gas Sectors: Advances and Prospects [PDF]

Artificial intelligence (AI) has gained much popularity in various sectors and has found applications in multiple areas, including occupational health and safety (OHS) risk management of the high-risk construction, mining, and oil and gas sectors. OHS risk management centers on identifying, assessing and controlling occupational risks systematically to prevent work-related injuries, illnesses and deaths. This review presents the advances in AI applications for OHS risk management in these sectors and synthesizes their barriers for better application

prospects. In the construction sector, AI can be employed in building information modeling during the design stage to identify and deal with the hazards of building models. AI can be deployed in construction sites through computer vision, sensor networks, knowledge-based systems, and machine learning to capture real-time site conditions, analyze the videos or pictures captured, and provide feedback to workers for appropriate responses. A similar setup involving the same components is also used for managing the OHS risks of surface or underground mining, particularly for monitoring the nvironmental conditions, detecting the presence of hazardous gases, and identifying hazards in locations that are remote and difficult to assess. Sensors can be attached to personal protective equipment and watches and the signals transmitted via Bluetooth to permit data collection for analysis and response by AI. In the oil and gas sector, sensors are extensively used to collect process safety data from wells, pipelines, valves, etc. for analytical and predictive Al. Al, especially, machine learning is used to create personalized training for workers based on their learning pace and characteristics. However, the major barriers identified are high cost, lack of support and skilledemployees, ethical issues, and the uncertainty of AI.

1.2 Conférence / ouvrage / thèse

New advances in building information modeling and engineering management: digital innovations in architecture, engineering and construction

YF Assagaf, AM Kawer, RA Putri, DNI Ahkam - Springer Cham, 2023. 231pp. ISBN 9783031302473. Built Heritage 8, 16 (2024)
DOI : https://doi.org/10.1186/s43238-024-00129-0

The ever-evolving landscape of architectural preservation requires a proactive approach that harnesses the power of modern technology and demonstrates how it can reimagine the approach to heritage preservation. 'New Advances in Building Information Modelling and Engineering Management' emerges as a timely and critical contribution challenging traditional paradigms and paving new paths for managing built heritage. Aligning with the Built Heritage Journal's focus on the field of heritage management, the book offers a compelling vision of how Building Information Modelling (BIM) can revolutionise our understanding, protection, and engagement with built heritage. The book, structured in thirteen chapters, explores the transformative potential of BIM to improve the technical aspects of conservation and restoration. Each chapter covers a specific aspect of using BIM to manage and preserve built structures: from meticulously crafted digital models that breathe life into long-forgotten architectural details to immersive augmented reality experiences that transport us through the layers of time. In this respect, the book promises an exciting glimpse into the future of built heritage management.

Rapport de veille BIM n°59