



Rapport de veille n° 48

BIM

30/06/2023

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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1. Références anglophones

1.1 Articles scientifiques

Improving Fourth Industrial Revolution (IR 4.0) Implementation among Skilled Workers in the Construction Industry [PDF]

AZY Go, N Kasim, R Zainal, MHI Abd Rahim, AH Omar - Research in Management of Technology and Business Vol. 4 No. 1 (2023) 997-1016

DOI: https://doi.org/10.30880/rmtb.2023.04.01.070

As the COVID-19 pandemic, the construction industry's operating process have changed, which accelerates the construction industry to move toward Industrial Revolution 4.0. Furthermore, skills that have been thought would endure over timecould quickly become obsolete among skilled workers, and upskilling the skilled workers will face formidable challenges arising from the influx of new technologies. Therefore, this research was undertaken to identify challenges, influencing factor, and steps to improve the IR 4.0 implementation among skilled workers in the construction industry. To accomplish the objectives, the study was carried out with the quantitative approach by using questionnaire as the instrument to collect the primary data. There were 248 respondents among G7 contractors selected at Johor state for this research and 145 respondents have been successfully collected. Statistical Package for the Social Science (SPSS) software was utilised to analyse the collected data in descriptive methods to determine the frequency and mean score values. Besides, secondary data information was obtained through various references such as journal, article, website or report related to IR 4.0 implementation among skilled workers in construction industry. Moreover, the result showed that the biggest challenge of the IR 4.0 implementation was insufficient of skilled workers, and the influencing factor of IR 4.0 implementation was to reduce the project activity errors, as well as the step to improve IR 4.0 implementation was providing the training program. In conclusion, this research provided a better understanding of the potential of IR 4.0 implementation for improving construction's skilled workers.

Occupational Safety and Health Improvements through Innovative Technologies in Underground Construction Sites: Main Trends and Some Case Histories

A Sorlini, L Maxia, M Patrucco, E Pira - Infrastructures, 2023, 8(6), 104 DOI : https://doi.org/10.3390/infrastructures8060104

When accompanied by a rigorous in-depth risk assessment and management, the introduction of innovative technologies in underground construction activities can substantially contribute to the overall quality and the health and safety of workers. The aim of this study is to investigate the potential improvements resulting from the use of emerging systems within this challenging environment, in the current context of technological development. The results, obtained through an analysis of the available literature on the topic, are divided based on their characteristics into support in design, Industry 4.0 context, management phase, and personal systems. Next, we discuss the results of some field tests of different emerging technologies drawn from experience gained in TELT—Tunnel Euralpin Lyon Turin SAS construction sites. The literature review and the feedback from practical applications in some case histories provide an overview of the main technologies and trends for the improvement of Occupational Safety and Health, although a fully integrated system still seems a distant prospect in underground construction sites. This study can contribute to the dissemination of the culture of safety and stimulate further research on the topic.



Computer vision and IoT research landscape for health and safety management on construction sites

S Arshad, O Akinade, M Bilal, S Bello - Journal of Building Engineering, 2023

DOI: https://doi.org/10.1016/j.jobe.2023.107049

Perform a systematic review of current literature to evaluate and summarise the health and safety hazards on construction sites. Science Direct, SCOPUS and web of science databases were searched for research articles published from 2013 to 2021. From an initial search of 350 research articles, we removed the duplicate articles and carried out an analysis of the abstract and full text that focused on health, safety, hazards, behaviour, on-site health and safety and the digital technologies leaving a total of 66 studies included. Computer vision and Internet of Things (IoT) are the dominant technologies for health and safety management. A comparison of the two technologies reveals that computer vision is dominant because of its non-intrusive approach to data collection; thus, supporting the scalability of computer vision approach at the expense of cost and development time. It will help to prevent on-site health and safety hazards and injuries on construction site. Computer vision offers non-intrusive benefits over Internet of Things (IoT); being able to detect the health and safety hazards. Computer vision has proved to be beneficial for better accuracy prediction, real time data monitoring, and model development for onsite health and safety analytics on the construction site.

Systematic Literature Review of Open Infrastructure BIM [PDF]

A Salzano, M Intignano, C Mottola, SA Biancardo... - Buildings, 2023, 13, 1593 DOI : https://doi.org/10.3390/buildings13071593

Representation and modeling using the building information modeling (BIM) methodology of civil works have become the subject of increasing attention in recent years, thanks to the potential offered by Open Infrastructure BIM (I-BIM). However, the complexity of infrastructure works, i.e., the variety of construction and technological systems, makes Open I-BIM very complex and challenging. The lack of systemic knowledge on the subject is another challenging factor. The aim of the following research work is to provide a synoptic overview of the existing scientific research, accompanied by the most recent studies in the field of computer modeling, its applications, and the main opportunities that Open I-BIM offers to the infrastructure sector. After a thorough review of 198 scientific articles published between 2013 and 2023, this study systematically presents a holistic review and critical reflection on the current status of the use of Open BIM in the infrastructure sector, with a focus on the development of the tools and methods used. The outcome of this work constitutes a systematic review of the literature with a bibliometric analysis on Open I-BIM, which is able to provide a knowledge base for identifying research trends, common problems, and the potential of developed methods.



1.2Conférence / ouvrage / thèse

BIM in Real Estate Operations: Application, Implementation, Digitalization Trends and Case Studies M May, M Krämer, M Schlundt – Springer, 2023 DOI : 10.1007/978-3-658-40830-5

This reference book - not only for practitioners - deals with all facets and issues of the application of Building Information Modeling (BIM) in real estate operations and Facility Management (FM). Starting from the basics and advantages of BIM as well as its development, all areas in real estate operations are illuminated where BIM can be usefully applied. BIM and CAFM basics, modern digitization techniques, data standards and data exchange, as well as interoperability and aspects of the economic viability of BIM projects are explained in detail. The procedure for introducing BIM, application scenarios and concrete practical examples round off the work, as does a look at current research topics and future developments.

BIM integrated digital twin framework for improving data visualization [PDF]

R Pedrosa Cabello – Final Thesis of Master in Aeronautical Engineering, Universitat Politecnica de Catalunya / Barcelonatec, 2023, 51 p.

The use of Building Information Modeling (BIM) methodology in Facility Management (FM) has become increasingly important due to its potential to improve data visualization and decision-making processes. Digital twins, a virtual replica of a physical building, can be integrated with BIM to provide FM with more detailed and easy-to-analyze information. This study presents a BIM integrated digital twin framework for improving data visualization, and a case study implementation of a digital twin using Autodesk Forge to showcase indoor air quality data provided by a sensor in a room. Results show that the implementation of a digital twin through sensor integration has a great potential to improve the efficiency and effectiveness of facility managers in their daily activities. The continuous information provided by the digital twin can help facility managers make informed and proactive decisions to ensure occupant safety, well-being, and energy efficiency of the building.

Examining Bim-Based Automated Rule-Checking Techniques In Construction [PDF]

A Soeiro, A Sidani, JP Martins - CIBW099W123 2023, Proceedings, Universidade Porto – FEUP, 21/22 June 2023, 14 p.

Research and Experimentation prove that construction safety planning and preparation during the Design phase significantly impact the safety of the construction workers. Construction work is an extensive and intense process consisting of several stages and activities that run simultaneously. The nature of the construction activities is dangerous and risky. Hence, construction workers' health and safety are threatened. However, previous studies claim that Designers and Architects are more concerned with the aesthetics of the building than with safety issues. In addition, they often lack construction safety knowledge, which is essential to effectively mitigate or reduce construction risks through design. This short review examines the Automated Rule checking tools that mainly assist in design for safety or Prevention Through Design (PtD) using BIM to oversee and mitigate construction risks during the construction phase. Based on a systematic review related to BIM-based health and safety practices, and after filtering the 99 collected articles, 19 articles related to Automated Rule checking were included in this short review. Findings suggest that the primary approach to preventing construction risks through design is creating an automated safety rule-based knowledge library for designers to



automatically check the BIM models for specific safety risks. Moreover, assisting in construction safety planning and explaining the construction risks to designers and architects.