



Rapport de veille n° 44

BIM

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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

[An automated BIM and system dynamics tool for assessing safety leading indicators in construction projects](#)

M Dadashi Haji, B Behnam - International Journal of Building Pathology and Adaptation, 2023

DOI : <https://doi.org/10.1108/IJBPA-05-2022-0072>

It is a well-accepted note that to enhance safety performance in a project by preventing hazards, recognizing the safety leading indicators is of paramount importance. In this research, the relationship between safety leading indicators is determined, and their impacts on the project are assessed and visualized throughout the time of the project in a proactive manner. Construction and safety experts are first interviewed to determine the most important safety leading indicators of the construction industry, and then the relationships that may exist between them are identified. Furthermore, a system dynamics model is generated using the interviews and integrated with an add-on developed on the building information modeling (BIM) platform. Finally, the impacts of the safety leading indicators on the project are calculated based on their time of occurrence, impact time and effective radius. The add-on generates a heat-map that visualizes the impacts of the safety leading indicators on the project through time. Moreover, to assess the effectiveness of the developed tool, a case study is conducted on a station located on a water transfer line. In order to validate the results of the tool, a survey is also conducted from the project's staff and experts in the field. Previous studies have so far focused on active safety leading indicators that may result in a particular hazard, and the importance of the effects that safety leading indicators have on another is not considered. This study considers their effects on each other in a real-time manner.

1.2 Conférence / ouvrage / thèse

[Using Virtual Technology for Job Hazard Analysis \[PDF\]](#)

PD Zia Ud Din, C Spitzmueller, HS Murari – University of Houston, dec 2022, 19 p.

Construction project teams often perform job hazard analysis (JHA) to identify risks and controls. Typically, an experienced worker leads a JHA session, because novice workers may not identify all hazards. Virtual reality (VR) applications, which have improved significantly in domains such as manufacturing and education, have the potential to increase JHA quality in a range of situations. The effectiveness of a VR application for JHA has not, however, been explored in depth, and this research aims to begin to fill that gap. Two interventions, a VR-based application for JHA and a paper-based JHA, were designed, developed, and implemented to measure their effectiveness. The VR-based JHA was more effective than the paper-based JHA, although statistical significance could not be established due to the small sample size. This report discusses the possible reasons for the successes and failures of these JHA approaches.

BIM and Construction Health and Safety: Uncovering, Adoption and Implementation

H Golizadeh, S Banihashemi, C Hon, R Drogemuller – Taylor and Francis group, June 2023, 168 p.

ISBN : 9781003224853

This book aims to conceptualise the implementation of Building Information Modelling (BIM) in the workplace health and safety (WHS) management of construction projects to reduce occupational accidents. The safety performance of the construction industry has always been a concern across the globe, however. This devastating reputation has drawn the concern of many nations. The potential functions of BIM can drastically alter the WHS practices of the construction industry. BIM facilitates WHS information exchange and management and supports better collaboration and project planning through virtual visualisation of the construction WHS management process. Despite an increasing interest in BIM, a successful mechanism of employing BIM for construction WHS management is absent. Therefore, this book aims to fill this dearth by diffusion of such innovative interventions with the current industry practice in a practical manner through proper identification of effective areas and evaluation of their impacts on the key criteria of construction projects and organisations. This approach will foster the implementation of BIM in the current state-of-WHS management in the industry and can potentially reduce occupational accidents on construction sites. This book is essential reading for researchers and professionals interested in how BIM technology can improve Health and Safety on construction projects. It is intended for engineers, project managers, construction managers, safety officers and managers.

Application of BIM in construction site safety: Systematic review [PDF]

NSM Shukri, E Aminudin, LS Yap, R Zakaria, MT Kiong - IOP Conference Series Earth and Environmental Science, 2023, 10 p.

DOI : 10.1088/1755-1315/1140/1/012014

Construction industry especially workers involve in many activities that may expose them to serious hazards. However, with the transformation of current development in technology, safety has become vital especially the needs in improvement of its application on site via digitalization. The exploration on the needs of safety especially in Building Information Modelling has become crucial and there is a need for the application especially the digital twin. The construction industry needs to improve the safety performance by new technology. Building Information Modeling is one of the technologies that are being explored recently. Hence, this paper aims to obtain a comprehensive review especially on the current trend of analysis based on current practice of emerging technology that applied in current practice. Methodology of this paper by info analysis and VOS Viewer. There were 11 different terms were used to obtain the relevant literature including Scopus, Google and books guideline. After data cleaning, there's almost 371 journal articles reviewed in between Jan 2011 and Aug 2021. There are 4 steps of framework being proposed which are analysis on the source of title, researcher, co-occurrence keyword and discussion. Hence from the results of co-occurrence based on the results shows that 21 keywords, as for the researcher were top 10 highlighted. It can be concluded that Building Information Modeling (BIM) and safety construction has the most citation for the current trend of research. Besides it is expected that this study has the potential outcome of research as references for next study on BIM and safety.

Construction productivity graph: a comprehensive methodology based on BIM and AI techniques to enhance productivity and safety on construction sites

FL Rossini, G Novembri - TEMA, 2023, 13 p.

The construction sector is characterised by distinctive issues such as product uniqueness, the reluctance to innovations introduction, players fragmentation leading to a low productivity level and a related high level of risk intended as the high likelihood of damages and injuries, and the consequences on construction productivity. The common EU regulatory framework provides a severe regulation about on-site working activities, but there is still no standard about the environmental and social sustainability of construction sites. Productivity assumes a crucial role to reduce the environmental impact of construction and positively influences the workers' safety

due to higher levels of organisation, reducing time, costs, resource consumption and wasted time. To this aim, the paper presents a methodology achieved augmenting BIM systems capabilities using Agent-Based Simulation techniques - ABS to simulate and optimise the onsite work. The augmented BIM model allows to analyse site conditions in terms of space utilisation and resource allocation, as resulting in the Construction Productivity Graph - CPG. This graphic representation synthesises the results obtained, making it possible to visualise the work progression in different working areas with the resources employed allowing to manage productivity rates and verify the work safety conditions