Rapport de veille n° 51

BIM

30/09/2023

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.

Table des matières

1. Références anglophones

1.1 Articles scientifiques

Reimagining construction safety: unveiling the impact of building information modeling (BIM) implementation

A Waqar, W Ahmed - Safety in Extreme Environments, 2023

DOI : https://doi.org/10.1007/s42797-023-00086-4

The construction industry encounters a multitude of safety challenges, leading to a significant incidence of workplace injuries and fatalities. Building Information Modelling (BIM) has been identified as a viable approach to enhance construction methodologies through the provision of a digital depiction of construction endeavors. Existing research has provided evidence regarding the potential influence of BIM on safety. However, there remains a dearth of comprehensive knowledge concerning the precise advantages and obstacles associated with integrating BIM into safety management protocols. The study aims to investigates the correlation between the adoption of BIM and the practices of safety management within the construction industry of Malaysia. The research employs a three-phase methodology, encompassing an extensive review of relevant scholarly literature, the collection of quantitative data through the administration of surveys and questionnaires, and the application of structural equation modelling. The methodology employed facilitates a thorough assessment of the effects of BIM on safety management practices within construction projects. The results of the study validate a notable and favorable correlation between the adoption of BIM and the management of safety. The research paper identifies several key factors that are crucial for the successful adoption of BIM. These factors encompass change management, leadership commitment, standardization, technology infrastructure, and training and education. Furthermore, this underscores the significance of conducting monitoring and evaluation activities, performing safety assessments, identifying hazards, and developing and implementing safety plans to improve safety protocols. The findings of this study offer significant contributions to the construction industry, policymakers, and researchers.

Potential features of building information modeling (BIM) for application of project management knowledge areas in the construction industry [PDF]

MS Raza, BA Tayeh, YIA Aisheh, AM Maglad - Heliyon, 2023, 18 p.

DOI : https://doi.org/10.1016/j.heliyon.2023.e19697

The construction industry (CI) plays a vital role in infrastructure development and improves the socio-economic status with employment opportunities and contribution to gross domestic progress (GDP) of countries. However, its productivity has diminished in recent years due to increasing complexities in construction projects (CPs) and lack of adoption of novel technologies such as Building Information Modeling (BIM). Also, there is a significant need of polishing the capabilities of construction practitioners to meet the project requirements in agreement with project management knowledge areas (PMKAs). This study, therefore, focused on identification and evaluation of factors necessary for measurement of extent of application of PMKAs. Subsequently, noteworthy features of BIM helpful for enhancing the capabilities of project managers (PMs) in application of PMKAs were identified from literature. A total of thirty-three factors for measurement of extent of application of PMKAs and sixty-six features of BIM helpful in enhancing the capabilities of PMs in application of PMKAs were found. The detailed study and analysis of these ninety-nine factors with the help of previous studies suggested that extent of application of PMKAs is measured with three sub-tasks i.e., plan, manage/develop, and monitor/control. In addition, by virtue of remarkable features and services of BIM, it helps in enhancing the capabilities of PMs in applying PMKAs: project integration, scope, cost, time, quality, resource, communications, procurement, risk, safety, and stakeholder management.

Impediments in BIM implementation for the risk management of tall buildings

A Waqar, I Othman, N Shafiq, A Deifalla, AE Ragab… - Results in Engineering, December 2023, volume 20

DOI : https://doi.org/10.1016/j.rineng.2023.101401

This study background highlights the increasing need for effective management of risks in tall buildings due to their complexity and potential hazards. BIM has been accepted as a potential solution for management of risks in tall buildings; however, its adaptation has been slow due to several obstacles. The purpose of this study is to identify and validate the impediments to the adaptation of BIM for management of risks. The study adopted a two-step methodology, consisting of exploratory factor analysis (EFA) and structural equation modelling (SEM). The data were collected through an online survey of professionals involved in design, construction, and management. Results of the study reveal six significant impediments: technical, integration, operational, creativity, privacy, and standardization. The findings provide theoretical contributions to the literature by identifying and validating the impediments to adaptation of BIM for risks in tall buildings. Practical implications suggest that organizations involved in design, construction, and management of tall buildings need to address the identified impediments to ensure successful adaptation of BIM for management of risks. This study contributes to the understanding of the obstacles to the adaptation of BIM for management of risks in tall buildings and provides insights for organizations to overcome these impediments.

1.2Conférence / ouvrage / thèse

BIM-A and BIM-VR systems for construction worker's safety cognition development

O Olugboyega, O Ejohwomu, ED Omopariola - Proceedings of the 39th Annual ARCOM Conference, 4-6 September 2023, University of Leeds, Leeds, UK, 10 p.

The creation of a system capable of recognizing the reciprocal interactions between psychological, behavioural, and situational variables of safety management is a viable solution to safety cognition development. Thus, this research suggests a qualitatively validated conceptual model of BIM—animation and virtual reality—system for improving construction workers' safety cognition. Combining BIM technologies with safety cognition components and choosing two BIM technologies that are beneficial for fostering and enhancing workers' safety cognition led to the creation of the system. Workers will only follow safety rules and regulations if they have mental models of safety knowledge that are relevant to the laws and regulations, according to the study.

A Digital Twin Model for Advancing Construction Safety

J Teizer, KW Johansen, CL Schultz, K Speiser, K Hong… - In: Fottner, J., Nübel, K., Matt, D. (eds) Construction Logistics, Equipment, and Robotics. CLEaR 2023. Lecture Notes in Civil Engineering, vol 390. Springer, Cham, pp. 201-212

DOI : https://doi.org/10.1007/978-3-031-44021-2_22

Information-driven management and control of physical systems have emerged over the past decade in multiple industrial sectors and more recently also in construction. Such models are called “Digital twins”. However, in the domain of construction, and in particular in its specialty discipline safety, a digital twin (DT) remains rather undefined. Little or no consensus exists among researchers and practitioners of two essential aspects: (a) the connection between the physical reality of a construction site (the “physical” twin) and the corresponding computer model (the “digital” twin) and (b) the most effective selection and exploitation of real-life data for supporting safe design, planning, and execution of construction. This paper outlines the concept for a Digital Twin for Construction Safety (DTCS), defining four essential steps in the DT workflow: (1) safe design and planning for hazard prevention, (2) conformance checking for ensuring compliance, (3) risk monitoring and control for proactive prediction and alerting, and (4) continuous performance improvement for personalized- or project-based learning. DTCS should be viewed as a system-based approach enhancing the overall safety performance rather than exclusively integrating sensing information or safety knowledge in Building

Information Modeling (BIM) for safety purposes. The result is an outline of our vision of the DTCS and a description of its modules in essential safety applications. Additionally, we point towards future research and development on this topic.