Rapport de veille n° 40

BIM

31/10/2022

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

Digital mock-ups as support tools for preventing risks related to energy sources in the operation stage of industrial facilities through design

Building information modelling (BIM) and product lifecycle management (PLM) technologies provide automatic model checking (AMC) tools that can be used for the prevention of occupational health and safety (OHS) risks through design (PtD). Considering that the risks related to energy sources during the operation stage of industrial facilities can be major, our objective is to propose a PtD approach for this type of risk that uses AMC tools. For this purpose, our methodology is based on the information systems design-science paradigm. Considering that both BIM and PLM mock-ups can be used to design industrial facilities and that Catia V5 is one of the main software programs used to design industrial equipment and facilities, our methodology specifically includes a comparative literature review of the uses of AMC tools to check BIM and PLM mock-ups and a comparative study of the OHS risk prevention capabilities of the AMC tools available in Catia V5. Therefore, the PtD approach that we propose is specific to Catia V5. It consists of: 1) extracting rules related to hazardous energy control from regulatory requirements and classifying them according to their automation potential, 2) expressing the rules in a form that is compatible with the RASE method, 3) interpreting the rules using the RASE method, and 4) using a macro script to automatically check the compliance of the digital mock-ups. The proposed approach's contribution is that it makes it possible to support facility designers in automatically identifying hazardous energy sources in systems. In future studies, we intend to couple this PtD approach with methods that integrate dynamic system behavior to assess the level of risk corresponding to the hazardous sources identified.

Exploring the Current Technologies Essential for Health and Safety in the Ghanaian Construction Industry [PDF]

Technology has undoubtedly played a vital role in improving construction procedures and processes for many years. However, its application for health and safety monitoring and management has not been fully exploited in the Ghanaian construction industry. This study aims at exploring the current technologies essential for health and safety in the Ghanaian construction industry. Three specific objectives are set: (1) to identify the current health and safety technologies important in the Ghanaian construction industry; (2) to examine the level of utilization of the current health and safety technologies in the Ghanaian construction industry; (3) to identify the barriers to the adoption of the current health and safety technologies in the construction industry. A structured questionnaire is used to solicit the views of 123 construction professionals who double as health and safety officers in large construction firms in Ghana. The questions are developed through a critical comparative review of the related literature. The data are analyzed via descriptive and inferential statistics. The findings reveal that key among the current technologies important for health and safety in the Ghanaian construction industry are wearable safety devices, geographic information systems, sensing technologies, virtual reality, and BIM. The findings further reveal a moderate level of usage of the key technologies among construction professionals in Ghana. Key among the barriers to the adoption of these technologies for health and safety in the Ghanaian construction industry are the factors 'excess costs related to acquiring new technologies', 'weak innovation culture', 'lack of continuous training of the workforce in adapting to the technologies', 'resistance to change with aging workforce', and 'little or no governmental support and regulations for the use of the

technologies'. The findings from this study provide insight into the ever-increasing state-of-the-art technologies used in the construction industry.

Proposal for the Integration of Health and Safety into the Design of Road Projects with BIM [PDF]

The high number of accidents in the construction sector makes the concept of prevention through design (PtD), which starts with the integration of an occupational risk assessment in this phase, increasingly important. To this end, BIM (building information modelling) is a methodology that provides benefits related to the management of health and safety in the design phase. Itsapplication in linear work projects is less developed than its application in building, even more so with regard to health and safety in BIM. This research proposes a methodology for integrating risk assessment into the design phase of BIM road projects, structuring the information, establishing the information integration processes, its analysis and risk management, and automating its integration into the model through zones. As a result, the research enables risk assessment in the BIM model through zones, differentiating risk values and allowing for the analysis of interferences between certain activities and the study of other specific activities in the design. As a result of the structure and organisation of the data, it is possible to export the data to IFC for coordination with other stakeholders. Thus, the final contribution of the research is the introduction of health and safety into road projects conducted with BIM, in compliance with legal requirements.

1.2 Conférence / ouvrage / thèse

Application of BIM for Effective Construction Safety Management in High Rise Buildings [PDF]

The construction industry has a higher occupational casualty rate than other industries. As a proactive approach to safety management, a good safety management system (SMS) can go a long way to help prevent accidents and occupational hazards. This work proposes the use of BIM 3D with the help of Autodesk Revit for the identification of hazards and risks at the designing stages and for implication and planning of effective safety measures. This is carried out from the inception of the project itself which later can be applied to the construction process based on efficient SMS. The SMS established is based on surveys conducted on 45 personnel in the construction industry. The top 5 important issues found to be associated with site safety were: Exposed Rebars; Laboures and Visitors without ID; CCTV monitoring of site; Signs not secured properly; Access to Fire Engine and personnel in case of fire break out.

A Conceptual Framework for Knowledge Management of Integrated Design and Construction Phase Audit Process on Infrastructure Project Based on Risk, Using WBS, BIM and Web to Enhance Construction Safety Performance [PDF]

Infrastructure development is massively done, but the current implementation of construction safety audit is not yet effective to prevent accident. Generally, the audit is limited to construction phase. Audit is rarely done in design phase, and if done, the audit result has never been used as reference for future audits. This research aims to formulate A Conceptual Framework for Knowledge Management of Integrated Design and Construction Phase Audit Process on Infrastructure Project Based on Risk, Using WBS, BIM and Web to Enhance Construction Safety Performance. The method that uses in the research is qualitative and quantitative analysis

to formulate the development. And the result targeted A Conceptual Framework for Knowledge Management of Integrated Design and Construction Phase Audit Process on Infrastructure Project Based on Risk, Using WBS, BIM and Web to Enhance Construction Safety Performance so construction safety audit can be optimized to improve construction safety as an effort to prevent construction accident and mitigate infrastructure calamity during accelerated development era in Indonesia.

Design and research of information systems for construction worker management services

C Hu, Y Zhuang, Z Liu, H Cai - Proc. SPIE 12451, 5th International Conference on Computer Information Science and Application Technology (CISAT 2022), 124512S (20 October 2022)
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With the accelerated urbanization and rapid socio-economic development, the construction process is also accelerating. Construction workers have more and more influence on the construction, and the effectiveness of construction worker management directly affects the quality and efficiency of the whole project construction. However, the traditional way of managing construction workers has problems such as incomplete information data of workers, difficulty in supervision, weak awareness of workers' safety and frequent safety accidents. Therefore, this paper designs and develops a construction worker management service information system based on IoT technology and effective integration of Building Information Modeling (BIM) and Radio Frequency Identification (RFID) technologies. The system realizes collaborative information sharing, achieves intelligent management of construction workers, improves construction site safety and quality management, and promotes the sustainable and healthy development of the construction industry, which in turn promotes the rapid development of China's economy.

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