BIM's role in improving the management and delivery of Occupational Safety and Health and saving lives in construction

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Despite significant improvements in construction processes, accidents are still persistent and have considerable financial and logistical impacts on projects. The UK Health & Safety Executive (HSE) recently revealed that there were 145 work-related deaths in 2022/23 with the highest number of 45 occurring in construction. Research has shown that the lack of *digital* OSH information is a significant factor contributing to the poor performance of OHS management in construction. BIM applied to OSH management has not yet yielded the same benefits as other BIM applications, such as in architectural or structural design, or project management. However, scientific literature indicates that BIM has the potential to optimize OSH management and that the construction industry, especially major projects and larger general contractors, are starting to adopt these digital technologies for use in OSH management [1]. BIM has a great potential for the planning of OSH and its use at the early stages of the project has been linked to an improvement in safety conditions [2]. *Standardization* of BIM for OSH is rapidly progressing. In 2018, the UK launched "PAS 1192-6 - Specification for collaborative sharing and use of structured Health and Safety information using BIM". This was a milestone in this area, since it was the first regulatory document worldwide to address the use and transmission of preventive information using BIM and it still remains a reference document in this field. Meanwhile ISO is preparing 19650-6 related to BIM uses for OSH.

BIM can be applied to several OSH areas including the following

Document / contractual management - a Common Data Environment (CDE) is useful for documenting OSH management and subsequent centralizing and archiving of documentation e.g. health and safety plans; approval of subcontractors, workers, and equipment; and, the health and safety file. Employers Information Requirements (EIR) and BIM Execution Planning (BEP) also represent good opportunities to define how OSH will be managed using BIM. BIM also facilitates cost control related to OSH, by enabling forecasting, quantification, correction and budgeting of safety equipment and activities.

Risk identification and assessment - early simulation of working conditions enabling identification, forecasting, and minimisation of risks before problems appear on the ground, namely at the design phase; identification of zones or time periods where there is a higher level of risk; the identification of potential constraints both in the work area and in the surroundings; automation and optimization of the assessment process and decision flow using specific plugins such as Dynamo.

Training - information is available regardless of date or time; increased risk recognition capacity of workers; a faster and better means of communicating and change information; the ability to easily overcome the language barrier.

Site planning - the location (space and volume) of temporary facilities can be assessed and managed more easily; more robust schedules and site layout and logistic plans can be generated; risk zones used as safety perimeters can be visualized; real-time images and models enhance communication between inspectors and supervisors.

Task planning and monitoring - the advance simulation of the sequence of tasks enables the exploration of various scenarios; design solutions can be conceived and assessed without exposing workers to risk and enabling less errors; helps anticipating level of risks due to temporal or spatial overlapping activities; it allows comparison between what is planned and what is done.

Emergency planning and accident investigation - workers can experience emergency scenarios and visualization of escape routes and shelters; better location of firefighting equipment; assisting in the investigation of unfavourable events and to easily illustrate the flaws found in current plans.

Although BIM for OSH research continues to make progress, challenges remain. Two of the most significant barriers are: 1) there is no universally agreed independent metrics that enable the observation and monitoring of implementation, trends and dynamics of BIM for OSH implementation; 2) there are no media or channels to enable the exchange of lessons learned about BIM for OSH.

The Digital4OSH group of researchers is developing a novel solution in the form of a BIM4OSH Observatory designed to address these gaps [3].
The Observatory will consist of three main components:

1) an online collaborative platform that hosts a collection of information about BIM for OSH practices and enables the sharing of experiences;
2) a statistical data collection instrument (barometer) using a regular standard on-line survey for measuring longitudinal implementation of BIM for OSH that will monitor trends in different countries and companies in a longitudinal approach;
3) collection, analysis, contextualization, and storage (through a searchable repository) of lessons learned, best practices, difficulties and barriers, trends and underlying factors information about real-world longitudinal successful case studies. These will be based in projects from different stakeholders that have a good level of BIM implementation and that can serve as anchor points for knowledge transfer to less mature stakeholders.

The adoption of BIM paves the way for a paradigm shift in OSH management, providing stronger links between production and safety. Therefore, any initiative that improves the take up of BIM for OSH in order to reduce accidents and deaths will be very important and considered welcome by the wider construction community.

References

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