# Relationship between the effectiveness of BIM methods and construction safety and health (Systematic Review)

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## INTRODUCTION

Construction safety is an international concern with a considerable number of injuries (Zhang et al., 2013). Due to complex settings of construction sites, safety as well as performance efficiency is often inadequate (Zhang et al., 2015). Commonly construction safety supervision depends heavily on manual inspection, which is labor-intensive and error-prone (Park et al., 2016). Accident prevention in the design stage of the project is characterized by proactive and effective actions, and analyzing the risks of accidents at the beginning of the life cycle of the project can ensure that safety in the construction phase and maintain good performance (VALÉRIO, 2013). To assist the supervisors and manual observation of the risks on site Building Information Modelling (BIM) is being adopted by Architecture, Engineering and Construction (AEC) industry (Eleftheriadis et al., 2017). The implementation of BIM could as well assist the continuous advancements in construction processes. This could provide essential decision-support tools for engineers throughout the design stage, ensuring the safety of the workers and improving their performance, nevertheless enriching onsite training (Wang & Chong, 2015). The objective of this systematic review is to identify the relationship between the efficiency and effectiveness of BIM and construction safety and health.

## MATERIAL AND METHODS

The systematic review was conducted using PRISMA Statement methodology, the research initiated by stating the question," what is the relationship between the efficiency and effectiveness of BIM and construction safety and health.?". The next step was listing some keywords related to the subject: "Building information modeling (BIM)", "construction", "health and safety", "project lifecycle", in addition to other synonyms to these keywords with multiple combinations. Some databases were chosen from FEUP library with the consideration of multidisciplinary categories and databases like Scopus, ScienceDirect, IEEE Xplore, Cambridge Journals Online. The exclusion criteria were the repeated articles, unrelated article, and articles that were not in English. The chosen articles were focused mainly on methods of BIM used in the project lifecycle, and any listed risks during the project lifecycle as well.

## RESULTS AND DISCUSSION

Seventeen articles were considered, from the total of 377 that were considered relevant to this review. The articles dated from 2007 the oldest, until 2017. The oldest articles were focusing on the basics of BIM (Kitchenham & Charters, 2007), after 2010 the articles focused on the risks in construction and related solutions using BIM (Li et al., 2015; Malsane et al., 2015; Martins & Monteiro, 2013; Park & Kim, 2013; Shen & Marks, 2016; Zhang et al., 2015; Zhang et al., 2013; Zhao, 2017), and the others were handling the risks from the beginning of the project's lifecycle et al., 2017; Wang & Chong, 2015). The results of this systematic review indicate a wide range of risks and solutions related to construction, in this process the articles helped categorizing the risks in which design stage, the tasks related to the risk and the models and methods used to solve these problems. This will be a process for identifying new ways and technologies relate to BIM to be developed.

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