



Interaction of Digital Twin Technology to the Safety of the Construction Industry: A Review



P.H.T. Maduranga^a, G.H.M.J.S. De Silva^a, R. Edirisinghe^b

^a*Faculty of Engineering, University of Ruhuna, Sri Lanka.*

^b*School of Engineering, RMIT University, Australia.*

Abstract

The construction industry faces several challenges, including accidents, hazards, low productivity and poor technological advancements. Digital Twin (DT) technology has been utilised to a greater extent in digitally advanced industries, including automotive and manufacturing. DT modelling is a faithful reflection of the physical object fed with sensor-based real-time data for processing. With the exponential growth of data sciences, digital systems are also becoming more intelligent with the potential of collecting, processing and storing incremental amounts of data. However, connecting data effectively with DT technology has presented solutions to a certain level and opened up new directions. The aim of this study was to review the current developments of DT in the safety monitoring of the construction industry. The articles with keywords of worker tracking, hazard identifications, warning, localization, decision making and hazard prediction areas combined with mathematical

algorithms and machine learning models, published after 2015, were selected for this review study. The review found that DT technology has significantly enhanced construction safety through advancements in tracking, real-time monitoring, safety training and early warning systems with productivity, cost and time-saving. Real-time monitoring and early warning technologies have converged more prominently than other domains in recent years. Among the review articles published from 2021 to 2023, 45% and 36% of articles were based on early warning and real-time monitoring, respectively. Programmable tools, algorithms and machine learning technologies are merging with DT technology with higher effectiveness. It was found that less focus has been given to environmental parameter-based safety prediction and precise real-time visualization and warning.

Keywords: Construction safety, Digital Twin, Internet of Things, Safety monitoring, Sensor-based safety monitoring.

*Corresponding Author: subashi@cee.ruh.ac.lk