INTELLIGENT STRUCTURAL STEEL TRACKING WITH A BIM / IOT BASED INTEGRATED SOLUTION

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Abstract:

The AEC industry lags behind other industries in terms of digitization and automation (Azhar et al., 2010; Valente et al., 2010). However, studies show that emerging integrative strategies such as BIM and IoT based tracking techniques, are transforming the traditional nature of the industry (Wu and Issa, 2013). In this research, a digital approach for intelligent tracking of structural steel by mapping its processes in a standard process modeling language is developed. The study aims to structure an intelligent decision-support framework using process-mapping workflow to incorporate sustainable resource-based design/fabrication decisions into the conventional steel manufacturing management practices. The proposed system is based on synergies between Building Information Modeling (BIM) and Internet of Things (IoT) in an Integrated Project Delivery (IPD) context.

A comprehensive literature review is conducted to identify the challenges of steel manufacturing conventional management practices. The extracted results are then verified in a case-study project. Before conducting the actual process mapping, key project phases, project participants, project digitalization goals, and the intended BIM-IoT tracking processes to achieve these goals were identified. Upon the identification of these specifications, the process map of BIM-IoT based tracking system was created using BPMN in Microsoft Visio. As concluded from the literature (Karasu et al., 2022), IPD was selected as a preferred delivery method to apply BIM-based management practices.

This research investigated critical challenges in promoting integrated BIM-IoT tracking practice in the construction industry. The process map provides an overall roadmap to plan for integrated BIM-IoT based intelligent inventory management practices which requires early involvement of the project stakeholders in the project, adds value to the project supply-chain, and reduces disputes, risks, and uncertainties. The study results show that in order to achieve the expected outcomes of implementing the developed process map, applying IPD principles in the project are indispensable, since they create the supporting infrastructure for integrated BIM-IoT based tracking practices.

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The developed process map offers a step-by-step operational guidance on detailed execution of integrated BIM-IoT based tracking practices. It ensures that the proper tools, required resources, and competent team members will be available to execute the tasks. The anticipated intelligent process outcomes will significantly enhance productivity, eliminate wastes, and reduce the costs associated with interoperability issues. The proposed process map is customizable to any project delivery method. The limitation to this research would be that the developed process map is still under development, and it has not been validated in an actual project yet.

Keywords: Internet of Things; IoT; Building Information modeling; BIM, Integrated Project Delivery; IPD; Process Mapping

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