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Transforming Construction: The Integration of Off-Site Techniques with Advanced Technologies

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Abstract : An increasing number of construction projects are adopting off-site construction techniques over traditional methods to address longstanding challenges. This research paper explores the integration of design for manufacture and assembly (DfMA), modern methods of construction (MMC), and building information modeling (BIM) within the construction industry. This study employs a mixed-methods approach, using case studies and a review of the existing literature to examine the role and combined application of each methodology in building projects of varying scales and durations. The study focuses on application mechanisms, stakeholder engagement, knowledge sharing, feedback, and performance metrics to explore the benefits, challenges, and transformative potential of integrating these methodologies. The findings indicate that the synergy among DfMA, MMC, and BIM significantly improves project efficiency, cost reduction, and overall quality. Standardization, increased collaboration among stakeholders, and the adoption of advanced technologies are also highlighted as necessary considerations to fully realize the benefits of this integration. The paper concludes with practical recommendations for industry practitioners seeking to efficiently implement these integrated approaches.

Keywords : BIM, building information modeling, case study, DfMA, design for manufacture and assembly, MMC, modern methods of construction, prefabrication
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