



Rapport de veille n° 75

BIM

30/09/2025

Objectif : *L'utilisation du BIM en phase de conception et de ses potentiels applications pour la prévention des risques*

La validation des informations fournies (exactitude, fiabilité, pertinence par rapport aux principes de prévention, etc.) est du ressort des auteurs des articles signalés dans la veille. Les informations ne sont pas le reflet de la position de l'INRS.

Les liens mentionnés dans le bulletin donnent accès aux documents sous réserve d'un abonnement à la ressource.

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1. Articles scientifiques

[The role of human resource management in implementing 'prevention through design' \(PtD\) strategies to enhance occupational health and safety in the construction industry: A thematic analysis approach \[PDF\]](#)

U Elbir – BMIJ, 2025, 13 (3):1391-1413

DOI : <https://doi.org/10.15295/bmij.v13i3.2571>

Occupational health and safety (OHS) in the construction industry remains a critical challenge, with high rates of workplace accidents and injuries. Prevention through Design (PtD) offers a proactive approach to mitigating risks by integrating safety considerations at the design phase. However, the role of human resource management (HRM) in facilitating PtD remains underexplored. This study addresses this gap by investigating how HR professionals contribute to the implementation of PtD through strategic planning, training, and cross-functional collaboration. Using a qualitative research design, data were collected from 12 industry experts, including HR managers, safety officers, engineers, and site supervisors. Thematic analysis was conducted using NVivo software, identifying six key themes: HR Involvement in PtD, Training and Competency Development, Cross-Functional Collaboration, Cultural and Organisational Barriers, Safety Culture Impact, and Measuring PtD Effectiveness. The findings reveal that early HR engagement in design planning enhances workforce readiness, training specificity, and the integration of safety culture. Despite these benefits, organisational resistance, hierarchical silos, and the lack of structured evaluation metrics hinder the full adoption of PtD. This study is novel in its focus on HR's strategic role in PtD, offering insights for construction firms, policymakers, and regulatory bodies. The research highlights the need for HR-driven PtD frameworks, improved collaboration mechanisms, and standardised safety assessment models. Future studies should explore longitudinal impacts of HR-led PtD strategies and the role of digital tools such as BIM and VR in safety training. The study contributes to both academia and industry by emphasising the transformational role of HR in designing safer construction environments.

[Artificial intelligence in construction project management: Trends, challenges and future directions](#)

S Savaş - Journal of Design for Resilience in Architecture and Planning, 2025, Volume 6, Issue 2 (221-238), 2025

DOI : <https://doi.org/10.47818/DRArch.2025.v6i2165>

Contemporary construction projects are characterized by escalating complexity, voluminous data flows, and stringent sustainability requirements, rendering conventional project management methods increasingly inadequate. In response, artificial intelligence (AI) has emerged as a transformative enabler in construction project management, offering advanced capabilities in predictive analytics, process automation, and intelligent decision support. This paper explores the role of AI in the identified principal functions of construction project management, including time management, cost estimation, quality assurance, occupational health and safety, risk mitigation, resource optimization, and design management through a narrative literature review. Analysis demonstrates that AI-driven approaches significantly enhance operational efficiency and system resilience by enabling proactive identification of schedule delays, cost overruns, and safety hazards. For example, image-recognition systems integrated with Internet-of-Things sensors facilitate real-time monitoring of site conditions and adaptive response to disruptions, while neural network models trained on historical project data yield more accurate cost forecasts than traditional estimation techniques. In the design management domain, generative design algorithms and AI-enhanced BIM integration have the potential to automate clash detection, optimize form and function, and generate innovative design alternatives that align with cost, energy, and sustainability objectives. Beyond efficiency gains, AI fosters a paradigm shift toward predictive, data-driven, and adaptive

management practices that strengthen project resilience, enabling teams to anticipate, absorb, and recover from unforeseen challenges while improving project performance and sustainability. Critical barriers to widespread AI adoption are also identified in this study. Fragmented and non standardized data ecosystems impede model training and interoperability with legacy systems, while organizational resistance and a shortage of professionals skilled in both AI and construction hinder implementation. Ethical and legal concerns—stemming from the “black-box” nature of many AI algorithms—further complicate accountability in safety critical decisions. By synthesizing these challenges, the strategic role of AI is highlighted not only as a technological innovation but also as a catalyst for cultural and organizational transformation toward more resilient project delivery. Targeted future research directions include empirical validation of AI tools in live project environments, development of sector specific AI frameworks tailored to the peculiarities of the construction industry, interdisciplinary collaboration among engineers, data scientists, and managers, and educational initiatives to upskill the workforce. Collectively, these steps will help bridge the gap between theoretical potential and real-world impact, positioning AI as a cornerstone of intelligent, resilient, sustainable, and high-performing construction project management.

Industry 4.0: The Digital Transformation for the Construction Industry [PDF]

AA Bagasi, N Alaboud, A Alshahrani, AS Karban... - Journal of Basic and Applied Sciences, 8(2), 2025, pp.1-8

Unlike, most industries that have lately undergone a significant digital transformation, the construction industry has been reluctant to incorporate emerging developing technologies. Hence, this study seeks to evaluate the relationships and challenges that the construction industry faced in implementing Industry 4.0. Accordingly, the study employed Interpretive Structural Modeling technique, which was enhanced using a fuzzy MICMAC analysis, it became evident that policy-level support plays a pivotal role in enabling broader adoption. The results highlight how a handful of strategic interventions—chief among them being regulatory reform and training infrastructure—could positively influence a range of dependent challenges. Rather than treating issues like ROI uncertainty or digital mistrust in isolation, this study emphasizes the importance of targeting systemic levers that shape the digital readiness of the industry. The hierarchy developed here may serve as a roadmap, offering guidance not only for decision-makers within construction firms but also for national bodies aiming to steer their sectors toward digital resilience. Future work should aim to test this model in real-world scenarios, especially in emerging economies where institutional readiness and infrastructural constraints are unique.

Enhancing Safety and Risk Management in Residential Construction through BIM Integration

IA Mahdi, MA Hilal - Engineering, Technology & Applied Science Research, 2025, Volume 15, Issue 5, 6 p.
DOI : <https://doi.org/10.48084/etasr.12566>

Despite the global advances in digital tools that enhance the construction safety, the residential projects in Baghdad continue to experience high accident rates, largely due to the political instability, economic limitations, and resistance to adopting new technologies. Building Information Modeling (BIM) has significant potential to support the proactive risk management in these projects, yet its use remains limited. This study demonstrates that BIM can improve the safety by enabling real-time hazard monitoring, strengthening the collaboration among stakeholders, and embedding safety standards from the earliest design stages. To adapt the international practices to the local conditions, it addresses challenges, such as high implementation costs, weak infrastructure, and the absence of clear regulations. Based on the findings, practical strategies, including government mandates for public projects, phased BIM adoption, and cloud-based solutions are proposed to reduce the resource constraints. Ultimately, the research outlines a pathway for applying BIM in high-risk environments, though its success will depend on the future improvements in safety documentation and IT capacity.

2. Conférence / ouvrage / thèse

[Study on Safety and Risk Management on Construction Projects with Special Reference to Building Projects in Pune \[PDF\]](#)

S Salame, N Ade, R Prakash, V Yadav - In S.S. Kulkarni, A. Agarwal, S. Yadav & T. JaiSai (Eds.), *Converging Horizons in Construction and the Built Environment: Digital, Sustainable, and Strategic Perspectives*, pp. 1492-1507

DOI : 10.17492/JPI/NICMAR/2507132

Access roads are essential for smoother connectivity, reducing travel time, and cutting down congestion. The Pune Municipal Corporation (PMC) has pinpointed 390 missing or inadequate access road sections that significantly disrupt the city's transportation flow. This research employs a blend of user surveys, on-site observations, and an extensive review of existing studies to comprehensively examine access roads. The literature review reveals a noticeable research gap, as most prior studies have largely focused on highways rather than the access roads that link primary routes to zones like residential neighbourhoods, commercial districts, and industrial areas. This study suggests that road designs should align with IRC standards. Upgrading these roads could bring wide-ranging benefits, from rising property values to stimulating economic growth and improving the daily lives of residents. The study provides guidance for urban planners to make access road development a priority in Pune's infrastructure plan, laying the groundwork for long-term, sustainable urban growth.

[Leveraging Large Language Models To Enhance Safety Awareness And Accessibility Of Osha Regulations For Construction Workers \[PDF\]](#)

N Mani, N Pradhananga, K Shrestha - 2025 European Conference on Computing in Construction, CIB W78 Conference on IT in Construction, Porto, Portugal, July 14-17, 2025, 8 p.

Traditional methods for reviewing construction safety regulations are typically manual, time-consuming, and susceptible to inconsistencies. This study explores the use of Large Language Models (LLMs) to simplify complex regulatory language, thereby enhancing employers' and workers' understanding of OSHA policies and regulations. By processing images and textual reports from construction sites and regulations, LLMs can identify hazards, match them to relevant regulations, and provide actionable recommendations. This real-time, context-specific approach bridges the gap between regulations and practical application, fostering a safer, more informed workforce. Additionally, LLMs improve accessibility and comprehension of OSHA standards, aligning safety practices with regulatory requirements more effectively.

[The impacts of digitalization on productivity in the Finnish construction industry \[PDF\]](#)

A Jämsä – University of Oulu, Faculty of Technology, Master's Thesis, September 2025, 121 p.

This thesis examines the effects of digitalization on construction productivity in the Finnish construction industry. The study is motivated by the sector's ongoing productivity challenges and the widespread expectation that digital tools can offer solutions. The aim of the thesis is to assess the productivity impacts of digitalization in the Finnish construction industry by combining insights from literature with data collected from Finnish construction professionals. The research was conducted using both theoretical and empirical analysis. First, a literature review synthesized existing knowledge on the productivity impacts, benefits and barriers of digitalization. Second, a survey among Finnish construction professionals mapped general expectations and experiences in the industry. Third, semi-structured interviews complemented the survey results by providing deeper insights and experiences across different sub-sectors of the industry. The findings reveal that digitalization is already delivering tangible productivity benefits, particularly through improved collaboration,

enhanced quality, fewer errors and more effective project management. However, these benefits are not equally distributed among stakeholders. Digitalization has increased the workload and costs of the design phase, while contractors and clients benefit from the efficiency gains enabled by digitalization and advanced models. Barriers such as interoperability issues, poor data quality, lack of standards, skills gaps, and resistance to change continue to hinder adoption. Overall, productivity improvements are not just the result of adopting digital tools, but from integrating them into unified processes that require skilled professionals, clear standards, and strong leadership. The results also show that the productivity impacts of digitalization are often indirect, stemming from process improvements rather than direct cost savings. Realizing its full potential requires organizational leadership, a fairer distribution of benefits, systematic training, and industry-wide progress in standards and productivity measurement. The findings are directly applicable to companies seeking productivity improvements and provide a comprehensive overview of the digital transformation of the Finnish construction industry.