

SPECIAL ISSUE EDITORIAL: CONSTRUCTION 5.0

SUBMITTED: March 2026

PUBLISHED: March 2026

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DOI: [10.36680/j.itcon.2026.017](https://doi.org/10.36680/j.itcon.2026.017)

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Established in 1975, the Australasian Universities Building Education Association (AUBEA) is a leading non-profit association of universities and institutes of technology in Oceania focused on teaching and research in the built environment. The association organises an annual conference for academics, researchers, and industry professionals to discuss advancements in education and research in the built environment, construction management, and building technologies. The AUBEA 2023 conference was held in Auckland, hosted by Massey University from 26–28 November 2023. The theme of the conference was Creating Capacity and Capability: Embracing Advanced Technologies for a Sustainable Future in Building Education and Practice.

As the construction sector confronts mounting pressures related to productivity, sustainability, workforce transformation, and digital disruption, Construction 5.0 has emerged as a human-centric paradigm that integrates advanced technologies with ethical, social, and environmental responsibility. Construction 5.0 refers to a new approach to the design, construction, and management of facilities, requiring seamless collaboration and data exchange between humans, robots, and a range of emerging technologies, such as digital twins, Building Information Modelling (BIM), Artificial Intelligence (AI), additive manufacturing, and remote sensing. However, this emerging paradigm is still in its early stages of development. A comprehensive understanding of the latest advancements in Construction 5.0 remains limited, and there are relatively few real-world cases demonstrating its successful implementation.

At the AUBEA 2023 conference, we received a substantial number of papers focused on understanding, developing, and adopting Industry 5.0 technologies to accelerate the digital transformation of the built environment lifecycle. These Construction 5.0 technologies offer new perspectives for analysing and advancing theoretical

techniques, aiming to improve construction productivity and promote sustainability. We therefore selected and invited 15 papers to submit extended versions for consideration in the Construction 5.0 special issue of the Journal of Information Technology in Construction. In addition, one paper originally submitted to the regular issue was also considered for inclusion in the special issue due to its strong alignment with the theme. Following the review process, 12 papers were finally accepted, which can be clustered into three main groups: (1) Applied Artificial Intelligence and Visual Computing, (2) Digital Information Infrastructure and Trust, and (3) Human-Centric Automation and Robotics. The first group, “Applied Artificial Intelligence and Visual Computing”, includes three papers. The first paper, “Foundations for Construction 5.0: A review-based taxonomy for construction worker action understanding” by Sudheer Kumar Nanduri and Venkata Santosh Kumar Delhi, establishes a hierarchical taxonomy for worker action understanding using 2D RGB camera-based computer vision and points out the lack of industry use cases as a key gap preventing technology adoption (Nanduri and Delhi, 2025). The second paper, “An innovative software development methodology for deep learning-driven visual computing in built environment applications” by Prasad Perera, Srinath Perera, Xiaohua Jin, Maria Rashidi, Samudaya Nanayakkara, Gina Yazbek, and Andrew Yazbek, proposes a software development methodology for deep learning-driven visual computing applications in the built environment (Perera et al., 2025). This methodology integrates design science principles with established AI-embedded software engineering practices. The third paper, “Artificial intelligence applications for proactive dispute management in the construction industry: A systematic literature review” by Mathusha Francis, Srinath Perera, Wei Zhou, and Samudaya Nanayakkara, reviews the latest studies on AI technologies for construction dispute management and recommends that regulatory bodies develop guidelines for the ethical use of AI in proactive dispute management within construction projects (Francis et al., 2025).

The second group, “Digital Information Infrastructure and Trust”, comprises five papers. The first paper, “A holistic approach to information requirements: Integration of Level of Information Need and Information Delivery Specification” by Elif Akbas, Marzia Bolpagni, André Borrmann, Stefan Boeykens, Martina Mellenthin Filardo, Liu Liu, and Jakob Beetz, examines data templates and standards related to Information Delivery Specification and Level of Information Need and proposes a holistic approach to integrating these schemas (Akbas et al., 2025). The second paper, “Decentralized and collaborative information management system in construction contract administration: A change management case study” by Navid Torkanfar, Ehsan Rezaazadeh Azar, and Brenda McCabe develops a contract information management system leveraging blockchain and ontology technologies (Torkanfar et al., 2025). The system is demonstrated through a change management case study. The third paper, “Integration of pavement finite element simulation with digital twin: Current practices, emerging trends, and future enablers” by Mohammad Oditallah, Morshed Alam, Palaneeswaran Ekambaram, and Sagheer Ranjha, analyses current practices and explores the integration of finite element methods into digital twins, proposing an architecture to support such integration (Oditallah et al., 2025). The fourth paper, “RealCONs: A digital framework for construction reporting accuracy and early delay detection” by Kambiz Radman, Mostafa Babaeian Jelodar and Ruggiero Lovreglio, introduces a digital framework for on-site project reporting management designed to enhance real-time data acquisition, project tracking, and reporting accuracy (Radman et al., 2025). The fifth paper, “An enabling tool for BIM-based embodied carbon assessment in high-rise construction” by Millaniyage Duleepa Dulshan Costa and James Olabode Bamidele Rotimi, develops a BIM-based tool to assess embodied carbon in high-rise buildings (Costa and Rotimi, 2026).

The third group, “Human-Centric Automation and Robotics”, includes four papers. The first paper, “Advances in Human-Robot Collaboration (HRC) in Construction 5.0 for building construction: A bibliometric and systematic literature review” by Gonzalo Garcés, comprehensively assesses the latest research and practices in HRC and identifies three key areas of progress: the development of AI-assisted classification systems to improve efficiency in specific tasks, the exploration of robots with emotional capabilities for more adaptive work environments, and the use of virtual reality training to optimise HRC (Garcés, 2025). The second paper, “Additive manufacturing technologies: State of the art and emerging trends in civil engineering” by Julien Gardan, Lotfi Hedjazi, and Ali Attajer, provides an overview of the current state of additive manufacturing in construction, including engineering processes, concrete and reinforced materials, advanced materials, and the development of new applications (Gardan et al., 2025). The third paper, “Ethical and social risks of exoskeletons in the construction industry: A systematic literature review” by Mariam Tomori, Likith Rudraraju, Omobolanle Ogunsejju, Nazanin Hatami, and Yong Cho, conducts a systematic literature review to examine the ethical and social implications of incorporating exoskeletons into the construction industry (Tomori et al., 2026). The fourth paper, “Classification of construction professionals’ attitudes toward using robots in applications of human robot collaboration” by Mahya Sam and

Bryan Franz, investigates the attitudes of construction professionals towards HRC in their workplace through a survey study and identifies three distinct classes of attitudes held by respondents: Controller, Assistant, and Partner (Sam and Franz, 2025).

Collectively, the contributions in this special issue demonstrate that Construction 5.0 is not solely a technological evolution, but a human-centred transformation of the built environment. The papers highlight how artificial intelligence, digital infrastructures, robotics, and advanced manufacturing must be developed in alignment with ethical considerations, workforce well-being, and societal needs. They also underscore the inherently interdisciplinary nature of this transition, requiring collaboration across engineering, computer science, management, social sciences, and policy domains. Importantly, the studies bridge theory and practice by grounding technological innovation in real-world case studies, industry applications, and implementation challenges. In doing so, this special issue advances both scholarly understanding and practical pathways for achieving a more sustainable, resilient, and human-focused construction industry.

We sincerely appreciate the journal editors' support and the reviewers' great efforts in making this special issue possible.

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