Internet of things adoption in construction: a scientometric review

Attachement

Thematic bibliographic coupling clusters analysis: Tables (Table 1, Table 2, and Table 3) and references

Table 1 construction digital twin and IoT application

Focusing Area	Citation	Source	Objective
Post-occupancy	(Cecere et al., 2024)	Lecture Notes in Networks and Systems	Enhancing energy efficiency in public buildings through optimization of electricity use.
	(Arsiwala et al., 2023)	Energy and Buildings	Reducing carbon emissions from existing buildings
	(ElArwady et al., 2024)	Developments in the Built Environment	Gathering building data to forecast and improve thermal comfort.
	(Opoku et al., 2024)	Automation in Construction	Using sensor data and BIM to guide decisions for building facility management.
	(Villa et al., 2021)	Applied Sciences (Switzerland)	Overseeing building conditions and setting up a system for maintenance management.
	(Lin & Cheung, 2020)	Journal of Management in Engineering	Improving air quality in parking garages through continuous monitoring.
Site Management	(Correa et al., 2024)	Lecture Notes in Civil Engineering	Monitoring and measuring prefabricated components on construction sites.

	(Kang et al., 2022)	Waste Management	Optimizing strategies for building demolition and waste handling.
	(Chernyshev et al., 2022)	International Scientific and Technical Conference on Computer Sciences and Information Technologies	Identifying construction elements in real-world settings and integrating them with BIM.
Structure and Infrastructure	(Dasari & Dogra, 2024)	Lecture Notes in Civil Engineering	Streamlining real-time monitoring and virtual visualization of structural data.
	(Iqbal et al., 2024)	Ain Shams Engineering Journal	Providing remote access to data on concrete compressive strength.
	(Chacón et al., 2024)	Structure and Infrastructure Engineering	Assessing bridge designs to enhance future maintenance planning.
	(Adibfar & Costin, 2022)	Journal of Construction Engineering and Management	Evaluating the effects of overweight vehicles on bridge integrity.
	(Jiang et al., 2022)	IEEE 6th Information Technology and Mechatronics Engineering Conference, ITOEC 2022	Developing a monitoring platform for railway infrastructure to boost management efficiency.
Safety	(Chan & Lau, 2023)	International Journal of Technology	Tracking site drilling robots to enable autonomous detection of risks.

Table 2 construction safety and IoT application

Focus Area	Citation	Source	Objective
Underground Construction	(Ding et al., 2013)	Automation in Construction	Monitoring environmental conditions and workforce activities to develop a warning system aimed at accident

			prevention during cross passage construction.
	(Zhou & Ding, 2017)	Automation in Construction	Implementing hazardous energy monitoring and developing a dynamic safety barrier warning system.
	(Zhou et al., 2019)	Automation in Construction	Ensuring crane operations are safe by monitoring hoist processes.
	(Kama et al., 2022)	Proceedings of the 2022 IEEE Dallas Circuits and Systems Conference, DCAS 2022	Designing and testing smart helmets for construction workers.
	(Mousavi et al., 2023)	Proceedings of the International Symposium on Automation and Robotics in Construction	Conducting dynamic and online remote monitoring of site hazards.
Site Management	(Zhong et al., 2014)	Sensors (Switzerland)	Monitoring tower crane operations to detect potential hazards and prevent on-site collisions.
	(Cheung et al., 2018)	Sensors (Switzerland)	Monitoring hazardous gas levels and environmental conditions to automate safety responses.
	(Jin et al., 2020)	Automation in Construction	Detecting and tracking unauthorized personnel, providing real-time alerts for enhanced safety management.
	(Lam et al., 2021)	Proceedings - 2021 International Conference on Computational Science and Computational Intelligence, CSCI 2021	Identifying and reporting abnormalities in precast structures to prevent falsework collapses.
	(Dwivedi et al., 2022)	International Conference on Electrical, Computer, Communications and	Developing a system for real-time fire detection.

		Mechatronics Engineering, ICECCME 2022	
	(Gómez-de-Gabriel et al., 2023)	Safety Science	Creating a system that adjusts power tool output based on the worker's proximity.
	(Teresa et al., 2023)	7th International Conference on Electronics, Communication and Aerospace Technology, ICECA 2023 - Proceedings	Developing a real-time earthquake monitoring system to provide actionable insights.
	(Moe et al., 2023)	IEEE Access	Creating a decentralized model for worker training.
	(Ding et al., 2022)	Frontiers of Engineering Management	create a smart barrier system to identify and mitigate hazardous energy risks
	(Chung et al., 2023)	International Journal of Construction Management	safety training model
Workers	(Mehata et al., 2019)	Proceedings of 1st International Conference on Innovations in Information and Communication Technology, ICIICT 2019	Detecting faults on construction sites and issuing emergency alerts to reduce fatalities.
	(Kwon & Kim, 2019)	Sensors and Materials	Predicting various types of accidents based on environmental conditions.
	(Kim et al., 2019)	Lecture Notes in Electrical Engineering	Monitoring worker locations to identify hazards and provide real-time alerts for accident prevention.
	(Yang et al., 2020)	Journal of Building Engineering	Monitoring compliance with personal protective equipment use and generating alerts for violations.

	(Rey-Merchán et al., 2021)	International Journal of Environmental Research and Public Health	Designing a virtual fence system to prevent workers from entering hazardous areas.
	(Martínez-Rojas et al., 2021)	Sensors	Delivering real-time risk assessments to workers via smart wristbands to prevent accidents caused by falling objects.
	(Khan et al., 2022)	American Society of Civil Engineers (ASCE)	Developing a smart safety hook system to reduce fall-related accidents.
	(Katika et al., 2022)	IST 2022 - IEEE International Conference on Imaging Systems and Techniques, Proceedings	develop a human-centric, mixed reality enabled ecosystem for enhancing worker safety and efficiency on large construction sites
	(Kumar et al., 2022)	Sustainability (Switzerland)	Monitoring worker health and equipment use in real-time.
	(Sowiński et al., 2023)	Sensors	Developing a privacy-preserving system for real-time worker health monitoring
	(Kim et al., 2023)	Journal of Construction Engineering and Management	Developing a proximity alert system to prevent struck-by injuries
	(Zhang et al., 2023)	Safety Science	Establishing virtual safety zones with real-time alerts for unauthorized access.
Infrastructure	(Fang et al., 2020)	ACM International Conference Proceeding Series	Developing a safety management system for nuclear power construction
	(Chen et al., 2022)	Proceedings of 2022 IEEE 5th International Electrical and	Enhancing safety management and control in substation project construction.

		Energy Conference, CIEEC 2022	
	(Yang et al., 2022)	2022 IEEE 2nd International Conference on Power, Electronics and Computer Applications, ICPECA 2022	Developing an intelligent construction site management system to improve safety in power transmission and transformation projects.
	(Menghao & Guogang, 2023)	Proceedings - 2023 2nd Asian Conference on Frontiers of Power and Energy, ACFPE 2023	Using video analysis and machine learning to identify and prevent safety violations in real-time in the power industry.
	(Yu et al., 2023)	Proceedings - 2023 International Conference on Power, Electrical Engineering, Electronics and Control, PEEEC 2023	Developing a centralized monitoring platform for deep foundation pit construction in the electric power sector.
	(Hussain et al., 2024)	Advanced Engineering Informatics	Predicting the reduced lifting capacity of aging tower cranes.
Post-occupancy	(Angelini et al., 2017)	International Archives of the Photogrammetry, Remote Sensing and Spatial Information Sciences - ISPRS Archives	Creating detailed architectural models of historical buildings to ensure visitor safety.
	(Lin & Cheung, 2020)	Journal of Management in Engineering	Managing air pollution (hazardous gases) in parking garages.

Table 3 BIM and Iot

Focus Area	Citation	Source	Objective
Design and Post-occupancy	(Dave et al., 2016)	Automation in Construction	Developing a digitally enabled framework for operating cognitive buildings that can collect, analyze, and utilize real-time building data to improve occupant comfort

	(Siountri et al., 2019)	ACM International Conference Proceeding Series	Integrating BIM, IoT, and blockchain to address security, management, and operational challenges within a museum setting
	(Valinejadshoubi et al., 2021)	Sustainable Cities and Society	Improving indoor thermal comfort monitoring and management
	(Wang, 2022)	Proceedings - 2022 International Conference on Artificial Intelligence of Things and Crowdsensing, AIoTCs 2022	Enhancing building operation and maintenance management for efficient resource utilization
	(Fan, 2023)	2nd IEEE International Conference on Distributed Computing and Electrical Circuits and Electronics, ICDCECE 2023	Real-time monitoring and control of lighting systems to optimize stadium lighting design
	(Chen, 2024)	Computer-Aided Design and Applications	Developing an optimization model for aesthetic quality and functionality of buildings
	(Qiang et al., 2024)	Lecture Notes in Civil Engineering	Creating a data management framework focused on the sustainability of green building design and operation
Life Cycle Management	(Kubler et al., 2016)	IFIP Advances in Information and Communication Technology	Developing a closed-loop building lifecycle management system from design to disposal phases
	(Xu & Lu, 2018)	Construction Research Congress 2018: Construction Information Technology - Selected Papers	Developing a closed-loop lifecycle management system for informed decision-making

	(Laurini et al., 2019)	ISPRS Annals of the Photogrammetry, Remote Sensing and Spatial Information Sciences	Collecting and centralized storage of real-time building life cycle data
	(Zhao et al., 2020)	IOP Conference Series: Earth and Environmental Science	Developing a collaborative supply chain information management model
	(Wan & Bai, 2021)	Advances in Intelligent Systems and Computing	Leveraging big data analytics to optimize building logistics operations
Prefabrication and Modular Construction	(Zhong et al., 2017)	Automation in Construction	promote real-time visibility and traceability of entire prefabrication process
	(Zhai et al., 2018)	Proceedings of International Conference on Computers and Industrial Engineering, CIE	Capturing, sharing, and analyzing real-time data to enhance the efficiency and effectiveness of Modular Integrated Construction
	(Brandín & Abrishami, 2021)	Smart and Sustainable Built Environment	Promoting data security for asset lifecycle management in offsite manufacturing
	(Rangasamy & Yang, 2023)	Proceedings of the International Symposium on Automation and Robotics in Construction	Optimizing prefabricated construction processes through generative design implementation
	(Solanki & Sarkar, 2024)	Lecture Notes in Civil Engineering	Developing a data flow model for real-time tracking of precast components
	(Wang et al., 2018)	International Journal of Construction Management	Developing shop floor material management system for panelized construction

Construction Site Management	(Iqbal et al., 2023)	Buildings	Automating the construction site layout printing process
	(Yi et al., 2023)	2023 International Conference on Artificial Intelligence and Computer Information Technology, AICIT 2023	Real-time construction material monitoring
	(Khazen et al., 2024)	Automation in Construction	Enhancing productivity and safety through real-time analysis of workers behaviors and locations
Structure and Infrastructure	(Ding et al., 2018)	ICNSC 2018 - 15th IEEE International Conference on Networking, Sensing and Control	bridge lifecycle closed-loop control through a real-time collaborative management system
	(Wu et al., 2018)	2018 IEEE International Conference on Advanced Manufacturing (ICAM)	Enhancing environmental protection in utility tunnel construction
	(Zhong & Ma, 2020)	Proceedings of the fib Symposium 2020: Concrete Structures for Resilient Society	Promoting intelligent bridge construction management
	(Wang, 2021)	Proceedings of the 6th International Conference on Inventive Computation Technologies, ICICT 2021	Combining Research and Development with intelligent modeling and cloud computing to enhance the construction process of stadiums and gymnasiums
	(Bi et al., 2021)	ACM International Conference Proceeding Series	Developing an intelligent construction management platform for the Guangzhou Evergrande Football Stadium project

	(Huang et al., 2022)	Buildings	Integrating BIM-GIS-IoT to create a system for efficient excavated soil management and recycling
	(Han et al., 2022)	Computers and Electrical Engineering	advancing compaction quality monitoring and management
	(Juanatas et al., 2023)	2023 IEEE 5th Eurasia Conference on IOT, Communication and Engineering, ECICE 2023	Implementing intelligent monitoring of tilting in high-rise buildings
	(Peng et al., 2023)	Proceedings of SPIE - The International Society for Optical Engineering	Developing a multi-source heterogeneous data fusion framework for tunnel construction management
	(Begić et al., 2023)	Engineering, Construction and Architectural Management	Optimizing routes, quantities, and timing for ready-mix concrete delivery across multiple construction projects
	(Araújo et al., 2024)	Construction Innovation	Elevating the accuracy of formwork management in cast-in-place concrete wall construction
	(Ziani et al., 2023)	IFIP Advances in Information and Communication Technology	Analyzing the environmental impact of digital infrastructure used in infrastructure lifecycle management (example of a bridge monitoring system)

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