

Supplementary Materials

Table S1: The 56 Selected Relvenat Article

No.	Author	Year	Title	Country	Source
1	Tang et al.	2022	Benefits of terrestrial laser scanning for construction QA/QC: a time and cost analysis.	China	Journal
2	London et al.	2021	Explanatory defect causation model linking digital innovation, human error and quality improvement in residential construction	Australia	Journal
3	Carvalho et al.	2021	Quality 4.0: an overview	Portugal	Journal
4	Fan et al	2021	Machine learning applied to the design and inspection of reinforced concrete bridges: Resilient methods and emerging applications.	China	Journal
5	Atkinson et al.	2021	Challenges in the adoption of mobile information communication technology (M-ICT) in the construction phase of infrastructure projects in the UK	UK	Journal
6	Staples and Spillane	2019	Exploring the Potential Improvement of Quality Control in the Construction Industry with the Use of Digital Technology	UK	Conference
7	Petrova and Sulova	2020	AI Governor for the Quality and the Strength of Bridges.	Bulgaria	Conference
8	Fernández-Caramés et al.	2018	A fog computing based cyber-physical system for the automation of pipe-related tasks in the industry 4.0 shipyard	Spain	Journal
9	Huong et al.	2021	Applying Bim and Related Technologies for Maintenance and Quality Management of Construction Assets in Vietnam	Vietnam	Journal
10	Chen et al.	2021	Application of Digital Technology in Safety Evaluation of Dabeishan Aqueduct.	China	Conference
11	Tuskaeva and Albegov	2021	Construction Control Organization with Use of Computer and Information Technologies in Context of Sustainable Development Providing	Russia	Conference
12	Kosse et al	2022	Digital Twin Framework for Enabling Serial Construction	Germany	Journal
13	Gallo et al.	2021	CARES research: product and process digitalization for design and manufacturing of prefabricated cardboard panels	Italy	conference
14	Loureiro	2020	Quality Management System according to the future of quality and Quality 4.0 principles and guidelines	Portugal	conference

15	Yurin et al.	2021	Quality 4.0. Time of revolutionary changes in the QMS	Russia	conference
16	Kazarova et al.	2022	Restoration of the Historically Valuable Town-Forming Object “Shevaldyshevskoe Courtyard, the Second Half of XVIII Century”, Using Building Information Modeling	Russia	conference
17	Wagner et al.	2020a	Qualities of the Unique: Accuracy and Process-Control Management in Project-based Robotic Timber Construction	Germany	conference
18	Martinez et al.	2020	Intelligent vision-based online inspection system of screw-fastening operations in light-gauge steel frame manufacturing	Canada	Journal
19	Pan et al.	2021	Research on quality assurance system of civil engineering talents' ability training under the background “the Belt and Road” based on BIM information technology	China	conference
20	Solod et al.	2021	Creation of Integrated Quality Systems for Standard Solutions of It Infrastructure Organization, Information Security of the Construction Complex at the Stage of the Real Estate Object Life Cycle (Construction Stage)	Russia	conference
21	Gamlath et al.	2020	Feasibility of Robotic Technology for The Advancement of Construction Industry in Sri Lanka	Sri Lanka	conference
22	Quiang et al.	2022	The intelligent ultra-wide caster for high-quality slabs at Rizhao Shandong	China	conference
23	Ma et al.	2018	Construction quality management based on a collaborative system using BIM and indoor positioning	China	Journal
24	Lu et al.	2022	Construction E-Inspection 2.0 in the COVID-19 Pandemic Era: A Blockchain-Based Technical Solution	Hong Kong	Journal
25	Li and Liu	2018	Applications of multirotor drone technologies in construction management	Australia	Journal
26	Nevalainen and Pellinen	2016	The use of a thermal camera for quality assurance of asphalt pavement construction	Finland	Journal
27	Buswell et al.	2022	Geometric quality assurance for 3D concrete printing and hybrid construction manufacturing using a standardised test part for benchmarking capability	UK	Journal
28	Akinici et al.	2006	A formalism for utilization of sensor systems and integrated project models for active construction quality control.	USA	Journal

29	Rinke et al.	2017	Simulating quality assurance and efficiency analysis between construction management and engineering geodesy	Germany	Journal
30	Sheng et al.	2020	Construction quality information management with blockchains	China	Journal
31	Kalyan et al.	2016	Construction quality assessment using 3D as-built models generated with Project Tango	Canada	Journal
32	Gorden et al.	2003	Combining reality capture technologies for construction defect detection: A case study	USA	Conference
33	Jaakkola and Toppi	2015	Model based quality assurance process in a infra construction project-Case Riippa-Eskola RU2 double rail project	Finland	Conference
34	Nordahl Rolfsen et al.	2019	On-site quality assurance: moving from forms to digital capture	Norway	Conference
35	Reisbacka et al.	2008	Automating construction project quality assurance with RFID-and mobile technologies	Finland	Conference
36	Koo et al.	2019	Enhancing Comprehensive Quality Assurance of Construction Projects toward Smart City Sustainability using Blockchain Technology	USA	Conference
37	Allagala and Samarakkody	2021	Blockchain-based tractability framework for quality assurance in construction projects	Sri Lanka	Conference
38	Rolfsen et al.	2021	The use of the BIM-model and scanning in quality assurance of bridge constructions	Norway	Conference
39	Winkler et al.	2019	Digitalization of data management and quality assurance in ground and tunnelling works	Austria	Conference
40	Doukari and Motamedi	2022	An Ontology to Enable Semantic BIM-Based Data Quality Assurance and Quality Control	UK	Conference
41	Elshafey et al.	2010	Thermal imaging technology: Quality control and quality assurance for construction of warm and hot mix asphalt pavements.	Canada	Conference
42	Koch and Vogelius	2006	Evaluation of Web and PDA-based quality assurance system on a building site	Denmark	Conference
43	Kim et al.	2016	Automated dimensional quality assurance of full-scale precast concrete elements using laser scanning and BIM.	UK	Journal

44	Wagner et al.	2020b	Towards digital automation flexibility in large-scale timber construction: integrative robotic prefabrication and co-design of the BUGA Wood Pavilion	Germany	Journal
45	Wilson et al.	2020	Ground penetrating radar as a quality assurance tool in hot-mix asphalt road construction	-	Journal
46	Moreu et al.	2020	Bridge Construction Monitoring using LIDAR for Quantified, Objective Quality-Control Quality-Assurance (QOQCQA)	USA	Conference
47	Häußler et al.	2020	Model-based quality assurance in railway infrastructure planning	Germany	Journal
48	Chen and Luo	2014	A BIM-based construction quality management model and its applications	China	Journal
49	Savu et al.	2017	Quality assurance framework for new property development: A decentralized blockchain solution for the smart cities of the future	Romania	Journal
50	Lee et al.	2014	Building Information Modelling for Quality Management in Infrastructure Construction Projects	USA	Conference
51	Yang	2021	Construction of School Quality Assurance System Based on Big Data Analysis. In International conference on Big Data Analytics for Cyber-Physical-Systems (pp. 381-388)	Philippines	Conference
52	Lupăşteanu et al.	2022	Condition assessment of buildings in Romania: A proposed method and case study	Romania	Journal
53	Farsäter et al.	2019	Building status obtained before renovating multifamily buildings in Sweden	Sweden	Journal
54	Lee et al.	2023	Vision-based inspection of prefabricated components using camera poses: Addressing inherent limitations of image-based 3D reconstruction	USA	Journal
55	Tran et al.	2021	A digital twin approach for geometric quality assessment of as-built prefabricated façades	Australia	Journal
56	Alaskar et al.	2021	Performance evaluation of reinforced concrete beams with corroded web reinforcement: Experimental and theoretical study	Saudi Arabia	Journal

Table S2: Detailed Analysis of the 56 Selected Relevant Articles

Author	Year	Method	Technology	Focus	Limitation	Country
Tang et al.	2022	Case study, quantitative	Terrestrial laser scanning	Checking the geometric quality of buildings	The study considers only the QA/QC tasks upon project completion. The QA/QC tasks during the construction, period are not considered. Second, this study only takes a residential building project as the case to collect QA/QC data. The QA/QC data collected from other types of projects with different structures can be substantially different, requiring future research.	China
London et al.	2021	Qualitative case study	mobile digital technology	Reduce defects in housing construction	Lack of methodology to examine how the full model can be translated into the analytical device for collaboration. Lack of efficient conceptualization	Australia
Carvalho et al.	2021	Qualitative(content analysis)	Data science and statistics, IoT, VR/AR, Cloud computing, Big data, blockchain. AI, ML, NeUral network and Deep learning,	Management commitment, customer involvement, supplier involvement, employee involvement, benchmarking technique, process management, information and analysis, formal strategy planning	Lack of empirical studies that demonstrate the influence of Industry 4.0 on quality management practices and company's performance,	Portugal
Fan et al	2021	Document analysis	Machine learning	Inspection of reinforced concrete bridges	Immaturity of machine learning applications in this domain	China
Atkinson et al.	2021	Exploratory Multiple Case Study	Mobile information communication technology, BIM	Quality delivery process at the construction phase	No emphasis on the clear push for digital technologies for quality assurance	UK

Staples and Spillane	2019	Qualitative method, document analysis	BIM, MOBILE TECHNOLOGY, mobile web, digital inspection test plan (ITP), REAL-TIME DATA PERFORMANCE DATA, point cloud of as, built work, 3d vision to mobile phone, condition-based monitoring, 2D geological models, radio frequency identification, photogrammetric vision, ID and 2D barcodes, mobile mapping platform.	Quality management at the construction phase for potential improvement of quality	No emphasis on the clear push for digital technologies for quality assurance	UK
Petrova and Sulova	2020	Qualitative method, document analysis	AI Governor, real-time data analysis	Checking the strength of buildings	Lack of unified method for monitoring bridges and controlling human safety as well as saving the national memory.	Bulgaria
Fernández-Caramés et al.	2018	Case study	Fog computing, cyber-physical system	Automatically Identifying and tracking the pipes of the infrastructure	Lack of clarity on the model's efficiency	Spain
Huong et al.	2021	Mixed method (survey, interview, and document analysis)	BIM, Barcode, Radio Frequency Identification (RFID), Sensor, Internet of Things (IoT), Augmented Reality (AR)	Maintenance and quality management	The technology readiness of the maintenance unit is narrow and needs to be improved	Vietnam
Chen et al.	2021	Case study	Drone aerial photography, BIM, and three-dimensional laser scanning	carrying out safety test and evaluation	The technology readiness of the maintenance unit is narrow and needs to be improved	China
Tuskaeva and Albegov	2021	Document analysis	BIM	control tasks of the entire construction production process.	The technology readiness of the maintenance unit is narrow and needs to be improved	Russia
Kosse et al	2022	Case study	Digital twin technology	checking the quality of precast concrete production	Lack of common implementation of the Industry 4.0 language for the application in the production of precast concrete elements to ensure quality	Germany

Gallo et al.	2021	Case study	BIM	achieving sustainability goals, such as reduction of errors, reduction of material wastes, cost and time predictability, product customization, and adaptability	Concerns the integration of BIM-based families with simulation tools for structural and energy-performances evaluation, particularly their integration with structural and Building Energy Modelling software.	Italy
Loureiro	2020	Case study	C-SUITE level	The needs and expectations of the stakeholders	The technology readiness of the maintenance unit is narrow and needs to be improved	Portugal
Yurin et al.	2021	Experiment	Learning mechanism of functioning (MFF) and GFM, PROBABILISTIC ITERATIVE ALGORITHM	To achieve efficient a quality tool	The technology readiness of the maintenance unit is narrow and needs to be improved	Russia
Kazarova et al.	2022	Case study	BIM	RESTORATION of building elements	The technology readiness of the maintenance unit is narrow and needs to be improved	Russia
Wagner et al.	2020	Case study	robotic fabrication	Achieve and control production quality by checking the accuracy.	The technology readiness of the maintenance unit is narrow and needs to be improved	Germany
Martinez et al.	2020	Experiment	automated vision-based online inspection system	Screw-fastening operations in light gauge steel frame manufacturing for quality modular construction project	Concerns on whether the inspection system will be taken to a continuous production setup to validate further and test its accuracy and applicability.	Canada
Pan et al.	2021	Case study	BIM	QUALITY cycling monitoring	The technology readiness of the maintenance unit is narrow and needs to be improved	China
Solod et al.	2021	Quantitative (ISM), Case study	IT SYSTEMS, INFORMATION SECURITY SYSTEMS	Improvement of management mechanisms	The technology readiness of the maintenance unit is narrow and needs to be improved	Russia
Gamlath et al.	2020	quantitative (survey), case study	robotic technology	Quality enhancement in construction	The technology readiness of the maintenance unit is narrow and needs to be improved	Sri Lanka
Quiang et al.	2022	Case study	intelligent ultra-wide caster	High-quality slab production	The technology readiness of the maintenance unit is narrow and needs to be improved	China

Ma et al.	2018	Case study	BIM, and Indoor positioning system	Ensure construction quality management, more effective and collaborative	Concern about Automatic association with construction schedules and inspector assignment with the system to generate a more detailed inspection plan; concern on Customization of the check items and criteria from the standard for different application scenarios; Integration of more technologies to collect the inspection data more conveniently, such as voice input, AR and image-matching technologies.	China
Wu et al.	2022	Case study	BIM, BLOCKCHAIN TECHNOLOGY	Ensure data transparency and protection during data collection on the project	Highly technical	Hong Kong
Li and Liu	2018	Case study	Multicopter drones	Quality checks, AND SUPERVISION	The technology readiness of the maintenance unit is narrow and needs to be improved	Australia
Nevalainen and Pellinen	2016	experimental	Thermal camera	Quantify the asphalt pavement homogeneity	The technology readiness of the maintenance unit is narrow and needs to be improved	Finland
Buswell et al.	2022	Case study	3D model	Checking the geometric quality of buildings	The technology readiness of the maintenance unit is narrow and needs to be improved	UK
Akinci et al.	2006	Case study	IoT	Defect management	The technology readiness of the maintenance unit is narrow and needs to be improved	USA
Rinke et al.	2017	Case study	Geodetic surveying technology	Optimizing the efficiency of the process	The technology readiness of the maintenance unit is narrow and needs to be improved	Germany
Sheng et al.	2020	Case study	Blockchain	Security and transparency	The technology readiness of the maintenance unit is narrow and needs to be improved	china
Kalyan et al.	2016	Case study	3D models	Quality control process	The technology readiness of the maintenance unit is narrow and needs to be improved	Canada
Gorden et al.	2003	Case study	Reality capture	Defect detection	The technology readiness of the maintenance unit is narrow and needs to be improved	USA
Jaakkola and Toppi	2015	Case study	IoT	Improve the process	The technology readiness of the maintenance unit is narrow and needs to be improved	Finland
Nordahl Rolfsen et al.	2019	Case study	3D Model	Improve the process	The technology readiness of the maintenance unit is narrow and needs to be improved	Norway
Reisbacka et al.	2008	Case study	RFID-and mobile technologies	Defect management	The technology readiness of the maintenance unit is narrow and needs to be improved	Finland

Koo et al.	2019	Case study	Blockchain	accuracy, effectiveness, transparency, and risk allocation	Highly conceptual	USA
Allagala and Samarakkody	2021	Experiment	Blockchain	Provide a higher level of transparency and visibility of the quality control process.	Lack of clear push for digital technologies for QA;	Sri Lanka
Rolfesen et al.	2021	Case study	BIM model, 3D laser scanning	Defect detection	Lack of efficient methodology conceptualisation	Norway
Winkler et al.	2019	Case study	Big data	Improve the process	Narrowness of technology readiness	Austria
Doukari and Motamedi	2022	Case study	BIM, AI	Improve the process	No emphasis on the clear push for digital technologies for quality assurance	UK
Elshafey et al.	2010	Case study	Thermal imaging	Improve the process	Lack of efficient methodology conceptualization	Canada
Koch and Vogelius	2006	Case study	Cloud computing	Improve the process	Narrowness of technology readiness	Denmark
Kim et al.	2016	Experiment	Mobile technology	Quality inspection and efficient management	The technology readiness of the maintenance unit is narrow and needs to be improved	UK
Wagner et al.	2020b	Case study	Robotics, prefabrication	Improve the process	Lack of efficient methodology conceptualisation	Germany
Wilson et al.	2020	Case study	Radar	Improve the process	Narrowness of technology readiness	-
Moreu et al.	2020	Case study	Lidar	Improve the process	No emphasis on the clear push for digital technologies for quality assurance	USA
Häußler et al.	2020	Case study	3D model	Clash detection	Lack of efficient methodology conceptualization	Germany
Chen and Luo	2014	Case study	4D model	Improve the process and quality control	Lack of clear push for digital technologies for QA	China
Savu et al.	2017	Case study	Blockchain	Improve the process of accountability	Lack of efficient methodology conceptualization.	Romania

Lee et al.	2014	Document analysis	BIM	Improve the process and quality control	Narrowness of technology readiness	USA
Yang	2021	Case study	Bigdata	Improve the process	The technology readiness of the maintenance unit is narrow and needs to be improved	Philippines
Lupășteanu et al.	2022	Case study	BIM	Improve the process	Lack of clear push for digital technologies for QA;	Romania
Farsäter et al.	2019	Case study	BIM	Improve the process	Lack of efficient methodology conceptualization.	Sweden
Lee et al.	2023	Case study	3D BIM, Camera	Improve the process	Narrowness of technology readiness	USA
Tran et al.	2021	Case study	Digital twin technology	Accuracy, completeness, and correctness of processes	No emphasis on the clear push for digital technologies for quality assurance.	Australia
Alaskar et al.	2021	Experiment	Corroded web reinforcement	Improve the process	Lack of clear push for digital technologies for QA.	Saudi Arabia