# CITATION REPORT List of articles citing

Digital Twin and Big Data Towards Smart Manufacturing and Industry 4.0: 360 Degree Comparison

DOI: 10.1109/access.2018.2793265 IEEE Access, 2018, 6, 3585-3593.

Source: https://exaly.com/paper-pdf/68984467/citation-report.pdf

Version: 2024-04-20

This report has been generated based on the citations recorded by exaly.com for the above article. For the latest version of this publication list, visit the link given above.

The third column is the impact factor (IF) of the journal, and the fourth column is the number of citations of the article.

#	Paper	IF	Citations
725	Industrial IoT in 5G environment towards smart manufacturing. <b>2018</b> , 10, 10-19		186
724	Development of the digital model of the jewellery production process for resource optimisation and prediction. <b>2018</b> , 25, 229-236		6
723	Insights into Digital Twin Based on Finite Element Simulation of a Large Hydro Generator. 2018,		7
722	Automatic Generation of a Simulation-Based Digital Twin of an Industrial Process Plant. 2018,		25
721	A Digital Twin Concept for Manufacturing Systems. 2018,		4
720	GraphEL: A Graph-Based Ensemble Learning Method for Distributed Diagnostics and Prognostics in the Industrial Internet of Things. <b>2018</b> ,		1
719	Digital Twin Service towards Smart Manufacturing. <b>2018</b> , 72, 237-242		166
718	Recursive Estimation of Battery Pack Parameters in Electric Vehicles. 2018,		1
717	Intelligent Adaption Process in Cyber-Physical Production Systems. 2018, 411-428		3
716	Enabling Communication Technologies for Automated Unmanned Vehicles in Industry 4.0. 2018,		15
715	Modeling of Cyber-Physical Systems and Digital Twin Based on Edge Computing, Fog Computing and Cloud Computing Towards Smart Manufacturing. <b>2018</b> ,		25
714	Optimizing the Scheduling of Autonomous Guided Vehicle in a Manufacturing Process. 2018,		14
713	Leveraging Digital Twins for Assisted Learning of Flexible Manufacturing Systems. 2018,		10
712	Resource virtualization: A core technology for developing cyber-physical production systems. <b>2018</b> , 47, 128-140		90
711	The future of manufacturing industry: a strategic roadmap toward Industry 4.0. <b>2018</b> , 29, 910-936		492
710	Cyber Physical Systems for Industry 4.0: Towards Real Time Virtual Reality in Smart Manufacturing. <b>2018</b> , 422-434		11
709	Smart manufacturing standardization: Architectures, reference models and standards framework. <b>2018</b> , 101, 91-106		49

708	Requirements of the Smart Factory System: A Survey and Perspective. <b>2018</b> , 6, 23		106
707	A Fog Computing and Cloudlet Based Augmented Reality System for the Industry 4.0 Shipyard. <b>2018</b> , 18,		65
706	Industrial cyber-physical system for condition-based monitoring in manufacturing processes. 2018,		10
705	A Review on Human-Centered IoT-Connected Smart Labels for the Industry 4.0. <i>IEEE Access</i> , <b>2018</b> , 6, 25939-25957	3.5	85
704	Fog Computing-Based Cyber-Physical Machine Tool System. <i>IEEE Access</i> , <b>2018</b> , 6, 44580-44590	3.5	15
703	Industrial Data Space Architecture Implementation Using FIWARE. 2018, 18,		29
702	A Predictive Maintenance Method for Shearer Key Parts Based on Qualitative and Quantitative Analysis of Monitoring Data. <i>IEEE Access</i> , <b>2019</b> , 7, 108684-108702	3.5	15
701	Methodological Framework Based on Digital Technologies for the Implementation of Industry 4.0 in SMEs. <b>2019</b> ,		4
700	Interacting with Intelligent Digital Twins. <b>2019</b> , 3-15		3
699	A Smart Manufacturing Service System Based on Edge Computing, Fog Computing, and Cloud Computing. <i>IEEE Access</i> , <b>2019</b> , 7, 86769-86777	3.5	87
698	A framework for rapid integration of IoT Systems with industrial environments. 2019,		13
697	Manufacturing conversion cost reduction using quality control tools and digitization of real-time data. <b>2019</b> , 237, 117678		28
696	Digital Twin-Based Optimization for Ultraprecision Motion Systems With Backlash and Friction. <i>IEEE Access</i> , <b>2019</b> , 7, 93462-93472	3.5	43
695	Cyber Physical Systems. Model-Based Design. <b>2019</b> ,		2
694	Enabling Technologies of Industry 4.0 and Their Global Forerunners: An Empirical Study of the Web of Science Database. <b>2019</b> , 3-13		3
693	Scientific, technological and economic issues in metal printing and their solutions. <b>2019</b> , 18, 1026-1032		164
692	Challenges in Digital Twin Development for Cyber-Physical Production Systems. <b>2019</b> , 28-48		6
691	Digital Twin Ranorex Test Automation of SIPROTEC 5 Protection Devices. <b>2019</b> ,		

690	optimized Neural Network of Predictive Maintenance for Air Booster Compressor (ABC) Motor Failure. <b>2019</b> ,	1
689	Visualisation of the Digital Twin data in manufacturing by using Augmented Reality. <b>2019</b> , 81, 898-903	54
688	Digital Twin: Vision, Benefits, Boundaries, and Creation for Buildings. <i>IEEE Access</i> , <b>2019</b> , 7, 147406-1474195	121
687	Fault injection in Digital Twin as a means to test the response to process faults at virtual commissioning. <b>2019</b> ,	10
686	. IEEE Access, <b>2019</b> , 7, 97052-97093	49
685	Industry 4.0 technologies basic network identification. <b>2019</b> , 121, 977-994	32
684	Digital-Twin-Based Job Shop Scheduling Toward Smart Manufacturing. <b>2019</b> , 15, 6425-6435	77
683	. 2019,	1
682	Rethinking Software Development for Collaboration Technologies. 2019,	
681	Digital Twin in Services and Industrial Product Service Systems:: Review and Analysis. <b>2019</b> , 83, 57-60	31
680	Intelligent decision support for maintenance: an overview and future trends. <b>2019</b> , 32, 936-959	29
679	Generating Mathematical Model of Equipment and Its Applications in PHM. 2019,	
678	A Unified Digital Twin Framework for Real-time Monitoring and Evaluation of Smart Manufacturing Systems. <b>2019</b> ,	13
677	Multi-Port Current Source Inverter for Smart Microgrid Applications: A Cyber Physical Paradigm. <b>2019</b> , 8, 1	160
676	A Review on Blockchain Technologies for an Advanced and Cyber-Resilient Automotive Industry. <i>IEEE Access</i> , <b>2019</b> , 7, 17578-17598	138
675	Scanning the Industry 4.0: A Literature Review on Technologies for Manufacturing Systems. <b>2019</b> , 22, 899-919	273
674	Digital Twins and Cyber <b>B</b> hysical Systems toward Smart Manufacturing and Industry 4.0: Correlation and Comparison. <b>2019</b> , 5, 653-661	267
673	Towards an Autonomous Industry 4.0 Warehouse: A UAV and Blockchain-Based System for Inventory and Traceability Applications in Big Data-Driven Supply Chain Management. <b>2019</b> , 19,	98

### (2019-2019)

672	Realistic interplays between data science and chemical engineering in the first quarter of the 21st century: Facts and a vision. <b>2019</b> , 147, 668-675		11
671	Digital Twins Approach and Future Knowledge Management Challenges: Where We Shall Need System Integration, Synergy Analyses and Synergy Measurements?. <b>2019</b> , 271-281		3
670	A Data-Driven Compensation Method for Production Index of Hydrometallurgical Process. <i>IEEE Access</i> , <b>2019</b> , 7, 50573-50580	3.5	2
669	A Review on the Application of Blockchain to the Next Generation of Cybersecure Industry 4.0 Smart Factories. <i>IEEE Access</i> , <b>2019</b> , 7, 45201-45218	3.5	133
668	Digital Twin and Services. <b>2019</b> , 203-217		27
667	Digital Twin and Big Data. <b>2019</b> , 183-202		8
666	Prognostic Health Management of Production Systems. New Proposed Approach and Experimental Evidences. <b>2019</b> , 39, 260-269		8
665	A LEGO  Manufacturing System as Demonstrator for A Real-Time Simulation Proof of Concept. <b>2019</b> ,		3
664	5-Dimensional Definition for a Manufacturing Digital Twin. <b>2019</b> , 38, 1705-1712		15
663	Towards an Architectural Design Framework for Data Management in Industry 4.0. 2019,		2
662	Investigating How the Cloud Computing Transforms the Development of Industries. <i>IEEE Access</i> , <b>2019</b> , 7, 181505-181517	3.5	5
661	Digitalization in Semiconductor Manufacturing- Simulation Forecaster Approach in Managing Manufacturing Line Performance. <b>2019</b> , 38, 1330-1337		4
660	Embedded systems for timedritical applications over Wi-Fi: design and experimental assessment. <b>2019</b> ,		2
659	Maximum Flow of Complex Manufacturing Networks. <b>2019</b> , 86, 245-250		2
658	Building the Tower of Babel for Big Data. <b>2019</b> ,		
657	Industry 4.0: A roadmap to digital Supply Chains. <b>2019</b> ,		2
656	An Integrative User-Level Customized Modeling and Simulation Environment for Smart Manufacturing. <i>IEEE Access</i> , <b>2019</b> , 7, 186637-186645	3.5	6
655	Developing knowledge on Digital Manufacturing to Digital Twin: a bibliometric and systemic analysis. <b>2019</b> , 38, 1174-1180		8

654	Towards Architecting Digital Twin-Pervaded Systems. <b>2019</b> ,	8
653	Digital Twin Driven Inclusive Manufacturing Using Emerging Technologies. <b>2019</b> , 52, 2225-2230	8
652	Data Super-Network Fault Prediction Model and Maintenance Strategy for Mechanical Product Based on Digital Twin. <i>IEEE Access</i> , <b>2019</b> , 7, 177284-177296	19
651	Virtual reality human-robot collaborative welding: A case study of weaving gas tungsten arc welding. <b>2019</b> , 48, 210-217	21
650	Digital Twins Model for Cranes Operating in Container Terminal. <b>2019</b> , 52, 25-30	9
649	A Digital Twin Proof of Concept to Support Machine Prognostics with Low Availability of Run-To-Failure Data. <b>2019</b> , 52, 37-42	16
648	Understanding the role of a Digital Twin in Integrated Vehicle Health Management (IVHM)*. 2019,	12
647	Design of Digital Twins for Optimization of a Water Bottling Plant. <b>2019</b> ,	8
646	Creation of Digital Twins by Combining Fuzzy Rules with Artificial Neural Networks. 2019,	2
645	. 2019,	3
644	A Survey on Digital Twin: Definitions, Characteristics, Applications, and Design Implications. <i>IEEE Access</i> , <b>2019</b> , 7, 167653-167671	203
643	Overview of Multisampling Techniques in Power Electronics Converters. 2019,	7
642	IoT-enabled dynamic lean control mechanism for typical production systems. <b>2019</b> , 10, 1009-1023	21
641	Digital twin-driven cyber-physical production system towards smart shop-floor. <b>2019</b> , 10, 4439-4453	49
640	A digital twin for rapid qualification of 3D printed metallic components. <b>2019</b> , 14, 59-65	97
639	Assessing IT availability risks in smart factory networks. <b>2019</b> , 12, 523-558	12
638	A Digital-Twin-Assisted Fault Diagnosis Using Deep Transfer Learning. <i>IEEE Access</i> , <b>2019</b> , 7, 19990-19999 <sub>3.5</sub>	116
	Evaluation of provincial integration degree of Ihternet + industrylbased on matrix grey relational	

636	Application of IoT-Aided Simulation to Manufacturing Systems in Cyber-Physical System. <b>2019</b> , 7, 2	27
635	Digital Twin in Industry: State-of-the-Art. <b>2019</b> , 15, 2405-2415	658
634	Digital twin-based process reuse and evaluation approach for smart process planning. <b>2019</b> , 100, 1619-1634	61
633	Knowledge-driven digital twin manufacturing cell towards intelligent manufacturing. <b>2020</b> , 58, 1034-1051	88
632	Scopus scientific mapping production in industry 4.0 (2011\( \textbf{Q}018\)): a bibliometric analysis. <b>2020</b> , 58, 1605-1627	73
631	Digital transformation effects on manufacturing readiness assessment. <b>2020</b> , 6, 49-54	1
630	A proactive material handling method for CPS enabled shop-floor. <b>2020</b> , 61, 101849	48
629	A smart manufacturing adoption framework for SMEs. <b>2020</b> , 58, 1555-1573	54
628	Industrial Wireless Sensor Networks Overview. <b>2020</b> , 1-17	2
627	An Entropy-Based Approach to Real-Time Information Extraction for Industry 4.0. <b>2020</b> , 16, 6033-6041	6
626	Tackling Faults in the Industry 4.0 Era-A Survey of Machine-Learning Solutions and Key Aspects. <b>2019</b> , 20,	64
625	Industry 4.0, digitization, and opportunities for sustainability. <b>2020</b> , 252, 119869	312
624	A state-of-the-art survey of Digital Twin: techniques, engineering product lifecycle management and business innovation perspectives. <b>2020</b> , 31, 1313-1337	143
623	A Blockchain Tokenizer for Industrial IOT trustless applications. <b>2020</b> , 105, 432-445	47
622	Digital twin-based cyber physical production system architectural framework for personalized production. <b>2020</b> , 106, 1787-1810	58
621	Technical enablers for the IoT. <b>2020</b> , 709-730	
620	Signal Processing Techniques for Power Efficient Wireless Communication Systems. 2020,	3
619	A Roadmap to Industry 4.0: Smart Production, Sharp Business and Sustainable Development. <b>2020</b> ,	25

618	Toward Edge-Based Deep Learning in Industrial Internet of Things. <b>2020</b> , 7, 4329-4341	69
617	A Real-Time Physical Progress Measurement Method for Schedule Performance Control Using Vision, an AR Marker and Machine Learning in a Ship Block Assembly Process. <b>2020</b> , 20,	3
616	Virtual Factory: Digital Twin Based Integrated Factory Simulations. <b>2020</b> , 93, 216-221	14
615	On the requirements of digital twin-driven autonomous maintenance. <b>2020</b> , 50, 13-28	16
614	Information and Communication Technology Solutions for the Circular Economy. <b>2020</b> , 12, 7272	37
613	Research and Implementation of Digital Twin Heterogeneous Data Exchange System. <b>2020</b> , 1617, 012063	
612	The development of a digital twin for machining processes for the application in aerospace industry. <b>2020</b> , 93, 1399-1404	19
611	A Conceptual Framework for AI-based Operational Digital Twin in Chemical Process Engineering. <b>2020</b> ,	5
610	Digital Twin for maintenance: A literature review. <b>2020</b> , 123, 103316	84
609	Application of Artificial Intelligence to an Electrical Rewinding Factory Shop. <b>2020</b> , 91, 735-740	3
608	A systematic literature review with bibliometric analysis of big data analytics adoption from period 2014 to 2018. <b>2020</b> , 34, 101-139	28
607	Digital TwinBriented real-time cutting simulation for intelligent computer numerical control machining. <b>2020</b> , 095440542093786	8
606	Simulation Framework for Cyber-Physical Production System: Applying Concept of LVC Interoperation. <b>2020</b> , 2020, 1-11	0
605	Construction 4.0: A Literature Review. <b>2020</b> , 12, 9755	47
604	Industry 4.0 adoption key factors: an empirical study on manufacturing industry. <b>2020</b> , 17, 697-725	14
603	Automating construction manufacturing procedures using BIM digital objects (BDOs). 2020, 20, 345-377	38
602	Human capital and AI in industry 4.0. Convergence and divergence in social entrepreneurship in Russia. <b>2020</b> , 21, 565-581	115
601	Disruptive Maintenance Engineering 4.0. <b>2020</b> , 37, 853-871	11

## (2020-2020)

600	. 2020,	О
599	Triboelectric nanogenerator sensors for soft robotics aiming at digital twin applications. <b>2020</b> , 11, 5381	133
598	Readiness of subtractive and additive manufacturing and their sustainable amalgamation from the perspective of Industry 4.0: a comprehensive review. <b>2020</b> , 111, 2475-2498	14
597	A digital twin-enhanced system for engineering product family design and optimization. <b>2020</b> , 57, 82-93	26
596	The Digital Twin Concept in Industry 🖟 Review and Systematization. <b>2020</b> ,	21
595	Quo Vadis Industry 4.0? Position, Trends, and Challenges. <b>2020</b> , 1, 298-310	11
594	Deployment of a Smart and Predictive Maintenance System in an Industrial Case Study. 2020,	3
593	Perspectives on the future of manufacturing within the Industry 4.0 era. <b>2020</b> , 1-21	21
592	Digital twin design for real-time monitoring 🖟 case study of die cutting machine. <b>2020</b> , 1-15	22
591	Virtual reality rendering methods for training deep learning, analysing landscapes, and preventing virtual reality sickness. <b>2020</b> , 147807712095754	1
590	Design Thinking: Creativity, Collaboration and Culture. <b>2020</b> ,	1
589	Investigation on industrial dataspace for advanced machining workshops: enabling machining operations control with domain knowledge and application case studies. <b>2020</b> , 1	6
588	Trace induction for complete manufacturing process model discovery. <b>2020</b> , 110, 29-43	
587	Computer Safety, Reliability, and Security. SAFECOMP 2020 Workshops. <b>2020</b> ,	1
586	. IEEE Access, <b>2020</b> , 8, 219934-219945	9
585	Augmented reality assisted calibration of digital twins of mobile robots. <b>2020</b> , 53, 203-208	5
584	Creating Collaborative Augmented Reality Experiences for Industry 4.0 Training and Assistance Applications: Performance Evaluation in the Shipyard of the Future. <b>2020</b> , 10, 9073	12
583	Digital Transformation Revolution with Digital Twin Technology. 2020,	9

582	Constructing a Reliable Health Indicator for Bearings Using Convolutional Autoencoder and Continuous Wavelet Transform. <b>2020</b> , 10, 8948	5
581	Using finite element analysis to develop a digital twin of a manufacturing bending operation. <b>2020</b> , 93, 568-574	7
580	A Multi-Sensor Approach for Digital Twins of Manual Assembly and Commissioning. <b>2020</b> , 51, 549-556	4
579	Emotions-aware Digital Twins For Manufacturing. <b>2020</b> , 51, 605-612	2
578	Availability of Manufacturing data resources in Digital Twin. <b>2020</b> , 51, 1125-1131	5
577	Information Model of a Digital Process Twin for Machining Processes. 2020,	5
576	Digital twin of functional gating system in 3D printed molds for sand casting using a neural network. <b>2020</b> , 1	5
575	Operation Procedures of a Work-Center-Level Digital Twin for Sustainable and Smart Manufacturing. <b>2020</b> , 7, 791-814	23
574	Cousins, Siblings and Twins: A Review of the Geological Model Place in the Digital Mine. <b>2020</b> , 9, 24	1
573	Time-Critical Wireless Networked Embedded Systems: Feasibility and Experimental Assessment. <b>2020</b> , 16, 7732-7742	6
572	A Digital Twin Framework for Industry 4.0 Enabling Next-Gen Manufacturing. 2020,	12
571	Digital Twin: Enabling Technologies, Challenges and Open Research. <i>IEEE Access</i> , <b>2020</b> , 8, 108952-10897 <b>3</b> .5	303
570	Probabilistic learning and updating of a digital twin for composite material systems. 2020,	5
569	. IEEE Access, <b>2020</b> , 1-1	1
568	The Influence of Smart Manufacturing towards Energy Conservation: A Review. 2020, 8, 31	11
567	Building and exploiting a Digital Twin for the management of drinking water distribution networks. <b>2020</b> , 17, 704-713	33
566	Cloud-Based Cyber-Physical Robotic Mobile Fulfillment Systems: A Case Study of Collision Avoidance. <i>IEEE Access</i> , <b>2020</b> , 8, 89318-89336	16
565	A Requirements Driven Digital Twin Framework: Specification and Opportunities. <i>IEEE Access</i> , <b>2020</b> , 8, 107781-107801	43

#### (2020-2020)

564	Optimal Energy Cooperation Policy in Fusion Center-Based Sustainable Wireless Sensor Networks. <b>2020</b> , 69, 6401-6414		О
563	Scheduling in Industry 4.0 and Cloud Manufacturing. <b>2020</b> ,		14
562	Using a Digital Twin for Production Planning and Control in Industry 4.0. <b>2020</b> , 39-60		10
561	Digital twin for geometric feature online inspection system of car body-in-white. <b>2020</b> , 1-12		8
560	Machine-Learning Methods for Computational Science and Engineering. <b>2020</b> , 8, 15		37
559	KnowIME: A System to Construct a Knowledge Graph for Intelligent Manufacturing Equipment. <i>IEEE Access</i> , <b>2020</b> , 8, 41805-41813	3.5	17
558	Characterising the Digital Twin: A systematic literature review. <b>2020</b> , 29, 36-52		317
557	Geospatial Artificial Intelligence: Potentials of Machine Learning for 3D Point Clouds and Geospatial Digital Twins. <b>2020</b> , 88, 15-24		16
556	Closed-loop digital twin system for air cargo load planning operations. 2020, 1-13		7
555	Taxonomy of Industry 4.0 research: Mapping scholarship and industry insights. <b>2020</b> , 37, 535-556		14
554	Digital Twin in the IoT Context: A Survey on Technical Features, Scenarios, and Architectural Models. <b>2020</b> , 108, 1785-1824		106
553	Integration of Industry 4.0 Related Technologies in Construction Industry: A Framework of Cyber-Physical System. <i>IEEE Access</i> , <b>2020</b> , 8, 122908-122922	3.5	46
552	Digital Twin for the Oil and Gas Industry: Overview, Research Trends, Opportunities, and Challenges. <i>IEEE Access</i> , <b>2020</b> , 8, 104175-104197	3.5	51
551	The Use of the Blockchain Technology and Digital Watermarking to Provide Data Authenticityon a Mining Enterprise. <b>2020</b> , 20,		6
550	The architectural framework of a cyber physical logistics system for digital-twin-based supply chain control. <b>2020</b> , 1-22		35
549	Bearing Intelligent Fault Diagnosis in the Industrial Internet of Things Context: A Lightweight Convolutional Neural Network. <i>IEEE Access</i> , <b>2020</b> , 8, 87329-87340	3.5	16
548	Blockchain-based data management for digital twin of product. <b>2020</b> , 54, 361-371		63
547	Exploring Service Science. <b>2020</b> ,		

546	Human Digital Twin for Fitness Management. <i>IEEE Access</i> , <b>2020</b> , 8, 26637-26664 3.5	52
545	Digital Triplet Approach for Real-Time Monitoring and Control of an Elevator Security System. <b>2020</b> , 4, 9	4
544	Integration of Novel Sensors and Machine Learning for Predictive Maintenance in Medium Voltage Switchgear to Enable the Energy and Mobility Revolutions. <b>2020</b> , 20,	23
543	Towards a semantic Construction Digital Twin: Directions for future research. <b>2020</b> , 114, 103179	169
542	A hybrid predictive maintenance approach for CNC machine tool driven by Digital Twin. 2020, 65, 101974	90
541	Digital twin: current scenario and a case study on a manufacturing process. <b>2020</b> , 107, 3691-3714	29
540	Digital twin-based smart assembly process design and application framework for complex products and its case study. <b>2021</b> , 58, 94-107	39
539	VREDI: virtual representation for a digital twin application in a work-center-level asset administration shell. <b>2021</b> , 32, 501-544	12
538	Digital twin modeling method based on biomimicry for machining aerospace components. <b>2021</b> , 58, 180-195	42
537	Mechanistic models for additive manufacturing of metallic components. <b>2021</b> , 116, 100703	92
536	From Industry 4.0 to Agriculture 4.0: Current Status, Enabling Technologies, and Research Challenges. <b>2021</b> , 17, 4322-4334	104
535	Data Construction Method for the Applications of Workshop Digital Twin System. <b>2021</b> , 58, 323-328	33
534	Digital twin-driven optimization of gas exchange system of 2-stroke heavy fuel aircraft engine. <b>2021</b> , 58, 132-145	13
533	Prediction maintenance integrated decision-making approach supported by digital twin-driven cooperative awareness and interconnection framework. <b>2021</b> , 58, 329-345	19
532	Expected impact of industry 4.0 technologies on sustainable development: A study in the context of Brazil's plastic industry. <b>2021</b> , 25, 102-122	50
531	Improving the performance of a Malaysian pharmaceutical warehouse supply chain by integrating value stream mapping and discrete event simulation. <b>2021</b> , 16, 70-102	10
530	Cooperating Robots for Flexible Manufacturing. 2021,	14
529	A Digital Twin approach based on nonparametric Bayesian network for complex system health monitoring. <b>2021</b> , 58, 293-304	21

528	New Paradigm of Data-Driven Smart Customisation through Digital Twin. <b>2021</b> , 58, 270-280		29
527	Metallurgy, mechanistic models and machine learning in metal printing. <b>2021</b> , 6, 48-68		84
526	Digital twin improved via visual question answering for vision-language interactive mode in human that have collaboration. <b>2021</b> , 58, 261-269		13
525	The applications of Industry 4.0 technologies in manufacturing context: a systematic literature review. <b>2021</b> , 59, 1922-1954		86
524	A digital twins concept model for integrated maintenance: a case study for crane operation. <b>2021</b> , 32, 1863-1881		6
523	Model Based Systems Engineering Concepts. <b>2021</b> , 1-40		
522	A digital twin-based big data virtual and real fusion learning reference framework supported by industrial internet towards smart manufacturing. <b>2021</b> , 58, 16-32		38
521	Design of a reference architecture for developing smart warehouses in industry 4.0. <b>2021</b> , 124, 103343	3	27
520	Roles of artificial intelligence in construction engineering and management: A critical review and future trends. <b>2021</b> , 122, 103517		114
519	Digital Twin as a Service (DTaaS) in Industry 4.0: An Architecture Reference Model. <b>2021</b> , 47, 101225		97
518	Food Supply Chains as Cyber-Physical Systems: a Path for More Sustainable Personalized Nutrition. <b>2021</b> , 13, 92-103		16
517	Smart Manufacturing and Intelligent Manufacturing: A Comparative Review. <b>2021</b> , 7, 738-757		56
516	Intelligent scheduling of a feature-process-machine tool supernetwork based on digital twin workshop. <b>2021</b> , 58, 157-167		20
515	Enabling technologies and tools for digital twin. <b>2021</b> , 58, 3-21		224
514	Remote Vehicular Control Network Test Platform. <b>2021</b> , 246-255		
513	. IEEE Access, <b>2021</b> , 9, 56915-56926	3.5	
512	Modelling and Simulation in Industry 4.0. <b>2021</b> , 57-72		2
511	A Study on Intelligent Manufacturing Industrial Internet for Injection Molding Industry Based on Digital Twin. <b>2021</b> , 2021, 1-16		2

510 . **2021**, 51, 253-265 14 Produktentwicklung im Kontext von Industrie 4.0 in der Automobilindustrie Eine bibliometrische 509 Analyse. 2021, 265-286 508 Reimagining the Digital Twin: Powerful Use Cases for Industry 4.0. 2021, 175-182 BlockTwins: A Blockchain-Based Digital Twins Framework. 2021, 177-186 507 Conclusions and Future Directions. 2021, 257-263 506 Towards Integrated Digital Twins for Industrial Products: Case Study on an Overhead Crane. 2021, 505 15 11,683 E-Commerce Supply Chain Process Optimization Based on Whole-Process Sharing of Internet of 504 5 Things Identification Technology. 2021, 126, 843-854 Towards a Digital Twin model for Building Energy Management: Case of Morocco. 2021, 184, 404-410 503 A Framework for Using Data as an Engineering Tool for Sustainable Cyber-Physical Systems. IEEE 502 3.5 5 Access, 2021, 9, 22876-22882 501 Application and research on digital twin in electronic cam servo motion control system. 2021, 112, 1145-1158 8 CNC Machine Tool Fault Diagnosis Integrated Rescheduling Approach Supported by Digital 500 2 3.5 Twin-Driven Interaction and Cooperation Framework. IEEE Access, 2021, 9, 118801-118814 Operational Implementation of Digital Production Twins in Single and Small Batch Production. 499 2021, 498 Recycling of Elastomer and Polymer Matrix Composites. 2021, 276-289 Seven Metaphors to Understand Digital Twins of Built Assets. IEEE Access, 2021, 9, 27167-27181 497 3.5 12 496 Digital Dimensions of Industry 4.0: Opportunities for Autonomic Computing and Applications. 2021, 347-383 The Role of AI, Machine Learning, and Big Data in Digital Twinning: A Systematic Literature Review, 495 3.5 35 Challenges, and Opportunities. IEEE Access, 2021, 9, 32030-32052 Significance of Quality 4.0 towards comprehensive enhancement in manufacturing sector. 2021, 2, 100109 494 13 Model Based Systems Engineering Concepts. 2021, 195-234

493

492	urban mobility. <b>2021</b> , 3,	3
491	Enabling Data-Based Applications in Manufacturing. <b>2021</b> , 189-202	
490	Study on the Virtual Localization System of AGV in Printing Workshop Based on Digital Twin Technology. <b>2021</b> , 548-553	
489	Intelligent Small Object Detection Based on Digital Twinning for Smart Manufacturing in Industrial CPS. <b>2021</b> , 1-1	36
488	Digital twin technology for smart manufacturing and industry 4.0: A bibliometric analysis of the intellectual structure of the research discourse. <b>2021</b> , 27, 96-102	7
487	Digital Twin Architecture and Development Trends on Manufacturing Topologies. <b>2021</b> , 259-286	1
486	. IEEE Access, <b>2021</b> , 1-1	2
485	Digital Twin Driven Requirement Conversion in Smart Customized Design. <i>IEEE Access</i> , <b>2021</b> , 9, 64414-6441३६	2
484	Digital Twins-Based Online Monitoring of TFE-731 Turbofan Engine Using Fast Orthogonal Search. <b>2021</b> , 1-12	2
483	Hierarchical Aggregation/Disaggregation for Adaptive Abstraction-Level Conversion in Digital Twin-Based Smart Semiconductor Manufacturing. <i>IEEE Access</i> , <b>2021</b> , 9, 71145-71158	2
482	Digital Twin Bionics: A Biological Evolution-Based Digital Twin Approach for Rapid Product Development. <i>IEEE Access</i> , <b>2021</b> , 9, 121507-121521	1
481	Technology Bundles in Maintenance: Ambivalences Between Virtuality and Assistance. <b>2021</b> , 57-78	
480	Digital twin application with horizontal coordination for reinforcement-learning-based production control in a re-entrant job shop. 1-17	2
479	Big Data Integration Solutions in Organizations: A Domain-Specific Analysis.	O
478	The Talent Training Mode of International Service Design Using a Human-Computer Interaction Intelligent Service Robot From the Perspective of Cognitive Psychology. <b>2021</b> , 12, 600218	2
477	A Deep Lifelong Learning Method for Digital Twin-Driven Defect Recognition With Novel Classes. <b>2021</b> , 21,	5
476	. <b>2021</b> , 8, 334-343	38
475	Empowering Digital Twin for Industry 4.0 using metaheuristic optimization algorithms: case study PCB drilling optimization. <b>2021</b> , 113, 1295-1306	13

474	Predictive Maintenance 4.0 Applied in Electrical Power Systems. 2021,	3
473	Multidimensional Data Modeling and Model Validation for Digital Twin Workshop. <b>2021</b> , 21,	3
472	Digital Twin Technologies for Turbomachinery in a Life Cycle Perspective: A Review. <b>2021</b> , 13, 2495	6
471	A construction method of digital twin model for contact characteristics of assembly interface. <b>2021</b> , 113, 2685-2699	2
470	Digital Twin and Reinforcement Learning-Based Resilient Production Control for Micro Smart Factory. <b>2021</b> , 11, 2977	6
469	Significant Applications of Big Data in Industry 4.0. 1-19	15
468	Automated fault detection for additive manufacturing using vibration sensors. 2021, 34, 500-514	8
467	Cutting Parameter Optimization for Reducing Carbon Emissions Using Digital Twin. <b>2021</b> , 22, 933-949	7
466	Subsystem selection for digital twin development: A case study on an unmanned underwater vehicle. <b>2021</b> , 223, 108629	3
465	Modelling for Digital TwinsPotential Role of Surrogate Models. <b>2021</b> , 9, 476	9
464	Demonstration and evaluation of a digital twin-based virtual factory. <b>2021</b> , 114, 1-19	12
463	Estimation of Stochastic Time Lags between Data Sources in Distributed Production Facilities Based on Cross-Correlated Signals. <b>2021</b> ,	
462	Symbiotic Relationship Between Machine Learning and Industry 4.0: A Review. 2130002	10
461	Recent Applications of Computing and Mobility Technologies to Modern Manufacturing. 2021,	
460	A Model-Driven Digital Twin Framework Development for Sulfur Dioxide Conversion Units Simulation. <b>2021</b> , 6, 122-131	О
459	Towards an Occupancy-Oriented Digital Twin for Facility Management: Test Campaign and Sensors Assessment. <b>2021</b> , 11, 3108	6
458	A framework to integrate novelty detection and remaining useful life prediction in Industry 4.0-based manufacturing systems. 1-21	4
457	A BIM-data mining integrated digital twin framework for advanced project management. <b>2021</b> , 124, 103564	74

### (2021-2021)

456	Digital Twins Collaboration for Automatic Erratic Operational Data Detection in Industry 4.0. <b>2021</b> , 11, 3186	10
455	Thermo-mechanical-optical coupling within a digital twin development for automotive LiDAR. 2021,	O
454	A review of digital twin in product design and development. <b>2021</b> , 48, 101297	24
453	Digital Twin-Driven Rapid Customized Design of Board-Type Furniture Production Line. <b>2021</b> , 21,	4
452	. <b>2021</b> , 109, 556-567	30
451	A Five-Step Approach to Planning Data-Driven Digital Twins for Discrete Manufacturing Systems. <b>2021</b> , 11, 3639	9
450	A generic methodology and a digital twin for zero defect manufacturing (ZDM) performance mapping towards design for ZDM. <b>2021</b> , 59, 507-521	19
449	Implementation of Cognitive Digital Twins in Connected and Agile Supply NetworksAn Operational Model. <b>2021</b> , 11, 4103	5
448	Artificial-Intelligence-Driven Customized Manufacturing Factory: Key Technologies, Applications, and Challenges. <b>2021</b> , 109, 377-398	27
447	Non-contact Current Measurement Method for Multi-conductor in Digital Twin Based on Magnetoresistance Sensors and PSO. <b>2021</b> ,	
446	Digital Twins: Review and Challenges. <b>2021</b> , 21,	20
445	Numerical Control Machine Optimization Technologies through Analysis of Machining History Data Using Digital Twin. <b>2021</b> , 11, 3259	2
444	Digital twins for information-sharing in remanufacturing supply chain: A review. <b>2021</b> , 220, 119712	15
443	Digital twin for smart manufacturing: a review of concepts towards a practical industrial implementation. <b>2021</b> , 34, 567-597	14
442	Analyzing interrelated enablers of industry 4.0 for implementation in present industrial scenario. <b>2021</b> , 44, 1241-1262	3
441	Six-Gear Roadmap towards the Smart Factory. <b>2021</b> , 11, 3568	7
440	Building a virtual factory: an integrated design approach to building smart factories. <b>2021</b> , ahead-of-print,	2
439	Industry 4.0 readiness of manufacturing sector in the Baltic Region. <b>2021</b> , 1140, 012019	

438	The Application and challenge of Digital Twin technology in Ship equipment. 2021, 1939, 012068	O
437	Digital twinBased cyber-physical system for automotive body production lines. <b>2021</b> , 115, 291-310	7
436	Constructing Digital Twin for Smart Manufacturing. 2021,	2
435	Digital Twin: Origin to Future. <b>2021</b> , 4, 36	66
434	Application of intelligent engineering in the planning of cyber-physical production systems. <b>2021</b> , 115, 117-123	6
433	Introducing digital twins to agriculture. <b>2021</b> , 184, 105942	41
432	Digital Twin for Automatic Transportation in Industry 4.0. <b>2021</b> , 21,	11
431	Smart manufacturing in intelligent digital mesh: Integration of enterprise architecture and software product line engineering. <b>2021</b> , 22, 100202	14
430	Digital Twin-Based Ecogreen Building Design. <b>2021</b> , 2021, 1-10	3
429	Business analytics in Industry 4.0: A systematic review. <b>2021</b> , 38, e12741	8
428	Design Engineering in the Age of Industry 4.0. <b>2021</b> , 143,	13
427	Industry 4.0 ten years on: A bibliometric and systematic review of concepts, sustainability value drivers, and success determinants. <b>2021</b> , 302, 127052	45
426	Information fusion and systematic logic library-generation methods for self-configuration of autonomous digital twin. 1	0
425	Big Data Provision for Digital Twins in Industry 4.0 Logistics Processes. <b>2021</b> ,	2
424	DIGITAL TRANSFORMATION STRATEGY DEVELOPMENT FOR INDUSTRY 4.0. <b>2021</b> , 10,	
423	Understanding the Evolution and Applications of Intelligent Systems via a Tri-X Intelligence (TI) Model. <b>2021</b> , 9, 1080	O
422	A review of industrial big data for decision making in intelligent manufacturing. <b>2021</b> , 29, 101021-101021	5
421	A digital-twin visualized architecture for Flexible Manufacturing System. <b>2021</b> , 60, 176-201	22

420	The ontology-based modeling and evolution of digital twin for assembly workshop. <b>2021</b> , 117, 395	2
419	Past, present, and future barriers to digital transformation in manufacturing: A review. <b>2021</b> , 60, 936-948	28
418	A digital twin concept for the development of a DEMO maintenance logistics modelling tool. <b>2021</b> , 168, 112399	2
417	Semi-Supervised Support Vector Machine for Digital Twins Based Brain Image Fusion. <b>2021</b> , 15, 705323	104
416	Digital Twin Modeling of a Solar Car Based on the Hybrid Model Method with Data-Driven and Mechanistic. <b>2021</b> , 11, 6399	1
415	Digital Twin for Equipment Management of Intelligent Railway Station. 2021,	
414	Bi-level dynamic scheduling architecture based on service unit digital twin agents. <b>2021</b> , 60, 59-79	9
413	Digital twins-based smart manufacturing system design in Industry 4.0: A review. <b>2021</b> , 60, 119-137	70
412	A twin data and knowledge-driven intelligent process planning framework of aviation parts. 1-18	3
411	Automation Pyramid as Constructor for a Complete Digital Twin, Case Study: A Didactic Manufacturing System. <b>2021</b> , 21,	4
410	Production of spherical polymeric composite powder for selective laser sintering via plasma assisted solid state shear milling: From theory to piezoelectric application. <b>2021</b> , 415, 129035	9
409	Enterprise Service Remote Assistance Guidance System Based on Digital Twin Drive. <b>2021</b> , 2021, 1-9	
408	Implementing Industry 4.0 principles. <b>2021</b> , 158, 107379	18
407	Data Quality Affecting Big Data Analytics in Smart Factories: Research Themes, Issues and Methods. <b>2021</b> , 13, 1440	
406	Industry 4.0: Latent Dirichlet Allocation and clustering based theme identification of bibliography. <b>2021</b> , 103, 104280	4
405	Industrial applications of digital twins. <b>2021</b> , 379, 20200360	19
404	Adoption of smart and sustainable manufacturing practices: An exploratory study of Indian manufacturing companies. 095440542110406	2
403	Digital twin application in the construction industry: A literature review. <b>2021</b> , 40, 102726	39

402	Challenges of modeling and analysis in cybermanufacturing: a review from a machine learning and computation perspective. <b>2021</b> , 1-14	2
401	A fusion data preprocessing method and its application in complex industrial power consumption prediction. <b>2021</b> , 77, 102520	3
400	Model improvement with experimental design for identifying error sources in a computational model. 1	О
399	Functional Requirements and Supply Chain Digitalization in Industry 4.0. 1	4
398	Digital twins in infrastructure: definitions, current practices, challenges and strategies. 1-10	2
397	Digital Twin Application. <b>2022</b> , 413-465	
396	Contrasting digital twin vision of manufacturing with the industrial reality. 1-18	2
395	Modular Framework for Digital Twins: Development and Performance Analysis. 1	O
394	Accessing spatial knowledge networks with maps. 1-16	
393	Development of a Digital Twin for Well Integrity Management in Underground Gas Storage Fields. <b>2021</b> ,	O
392	The impact of Industry 4.0 on organizational performance: the case of Pakistan's retail industry. <b>2021</b> , ahead-of-print,	2
391	Smart cyber-physical production system enabled workpiece production in digital twin job shop. <b>2021</b> , 13, 168781402110408	1
390	Digital Twin in Electrical Machine Control and Predictive Maintenance: State-of-the-Art and Future Prospects. <b>2021</b> , 14, 5933	10
389	Intrinsic value of food chain data. <b>2021</b> , 35, 44-47	
388	Sustainable Development of Smart Manufacturing Driven by the Digital Twin Framework: A Statistical Analysis. <b>2021</b> , 13, 10139	12
387	Digital twin paradigm: A systematic literature review. <b>2021</b> , 130, 103469	69
386	Process-oriented unstable state monitoring and strategy recommendation for burr suppression of weak rigid drilling system driven by digital twin. 1	O
385	A Survey on AI-Driven Digital Twins in Industry 4.0: Smart Manufacturing and Advanced Robotics. <b>2021</b> , 21,	15

384	Human-Machine Integration in Processes within Industry 4.0 Management. <b>2021</b> , 21,	4
383	Blockchain-Empowered Digital Twins Collaboration: Smart Transportation Use Case. <b>2021</b> , 9, 193	14
382	A digital twin-based decision analysis framework for operation and maintenance of tunnels. <b>2021</b> , 116, 104125	6
381	Multi-level production process modeling language. <b>2021</b> , 66, 101053	2
380	Application-Driven Network-Aware Digital Twin Management in Industrial Edge Environments. <b>2021</b> , 17, 7791-7801	9
379	Digital transformation capability maturity model enabling the assessment of industrial manufacturers. <b>2021</b> , 132, 103522	11
378	Ontology-based information modeling method for digital twin creation of as-fabricated machining parts. <b>2021</b> , 72, 102173	4
377	ELEGANT: Security of Critical Infrastructures With Digital Twins. <i>IEEE Access</i> , <b>2021</b> , 9, 107574-107588 3.5	1
376	Electrical power equipment digital twins. Basic principles and technical requirements. <b>2021</b> , 288, 01029	
375	End-to-End-Architekturen zur Datenmonetarisierung im Industrial Internet of Things (IIoT). <b>2021</b> , 169-206	
374	Digital Twins for Students: Approaches, Advantages and Novelty. 2021,	
373	Is Human Digital Twin possible?. <b>2021</b> , 1, 100014	17
372	Digital Twins Concepts, Challenges, and Future Trends. <b>2021</b> , 48-60	O
371	Intelligent Digital Twin System in the Semiconductors Manufacturing Industry. <b>2021</b> , 99-113	O
370	Digital Twin for Smart School Buildings. <b>2021</b> , 320-340	1
369	Structural Strength Improvement of 3D Printing Parts from Topology Optimised Design Using Anisotropic Material Modelling. <b>2021</b> , 439-448	
368	Combining Visual Analytics and Machine Learning for Reverse Engineering in Assembly Quality Control. <b>2021</b> , 2021, 60405-1-60405-13	
367	Towards the Development of Digital Twins for the Bio-manufacturing Industry. <b>2021</b> , 176, 1-34	6

366	Ubiquitous Manufacturing in the Age of Industry 4.0: A State-of-the-Art Primer. 2020, 73-112	5
365	Design Modelling with Next Generation Parametric System Packhunt.io. <b>2020</b> , 277-287	1
364	Multi-modelling and Co-simulation in the Engineering of Cyber-Physical Systems: Towards the Digital Twin. <b>2019</b> , 40-55	15
363	Internet of Things. <b>2020</b> , 217-245	13
362	The Digital Twin as a Service Enabler: From the Service Ecosystem to the Simulation Model. <b>2020</b> , 347-359	12
361	Information Systems Engineering with Digital Shadows: Concept and Case Studies. 2020, 70-84	19
360	Towards a DevOps Approach in Cyber Physical Production Systems Using Digital Twins. <b>2020</b> , 205-216	1
359	Data-Driven Maintenance Delivery Framework: Test in an Italian Company. <b>2020</b> , 322-329	1
358	Digital Twin Representations of Concrete Modules in an Interdisciplinary Context of Construction and Manufacturing Industry. <b>2020</b> , 101-115	4
357	Model Based Systems Engineering Concepts. <b>2020</b> , 1-40	2
356	Discussion on the Application of Digital Twins in the Wear of Parts. <b>2021</b> , 145-153	1
355	Digital Twins as Software and Service Development Ecosystems in Industry 4.0: Towards a Research Agenda. <b>2020</b> , 51-64	2
354	Inspiration of Industry 4.0 to Enable a Proactive Sustainability Assessment Model through the Supply Chain. <b>2020</b> , 52, 356-362	3
353	Digital twin-enabled smart industrial systems: a bibliometric review. <b>2021</b> , 34, 690-708	7
352	The Research of Ontology-based Digital Twin Machine Tool Modeling. 2020,	1
351	The Life Cycle State Evaluation of Electrical Equipment based on Digital Twins. 2020,	O
350	Digital twin-based Optimization on the basis of Grey Wolf Method. A Case Study on Motion Control Systems. <b>2020</b> ,	2
349	Concept Design of a System Architecture for a Manufacturing Cyber-physical Digital Twin System. <b>2020</b> ,	3

348	Towards Smart Manufacturing Using Spiral Digital Twin Framework and Twinchain. 2020, 1-1	11
347	Digital Twins: State-of-the-Art and Future Directions for Modeling and Simulation in Engineering Dynamics Applications. <b>2020</b> , 6,	33
346	Intelligent Maintenance Systems and Predictive Manufacturing. <b>2020</b> , 142,	10
345	Use of simulation by modelling of conveyor belt contact forces. <b>2019</b> , 9, 709-715	3
344	A Reference Model for Evolving Digital Twins and Its Application to Cases in the Manufacturing Floor. <b>2019</b> , 3, 20190049	3
343	Maintenance 4.0. <b>2020</b> , 1-30	2
342	Design and Implementation of Digital Twin for Predicting Failures in Automobiles Using Machine Learning Algorithms.	3
341	Digital Twins From Smart Manufacturing to Smart Cities: A Survey. <i>IEEE Access</i> , <b>2021</b> , 9, 143222-143249 3.5	18
340	Digital Twin (DT) in Smart Energy Systems - Systematic Literature Review of DT as a growing solution for Energy Internet of the Things (EIoT). <b>2021</b> , 312, 09002	1
339	Collaborative Augmented Digital Twin: A Novel Open-Source Augmented Reality Solution for Training and Maintenance Processes in the Shipyard of the Future. <b>2021</b> , 7, 10	1
338	Digital Twin for Data-Driven Engineering Design. <b>2022</b> , 149-172	
337	A Roadmap to Integrate Digital Twins for Small and Medium-Sized Enterprises. <b>2021</b> , 11, 9479	3
336	Task Allocation: Contemporary Methods for Assigning HumanRobot Roles. 2022, 215-233	
335	Novel Materials for Urban Farming. <b>2021</b> , e2105009	5
334	A comprehensive study on current and future trends towards the characteristics and enablers of industry 4.0. <b>2021</b> , 100294	11
333	Digital Twins of the Water Cooling System in a Power Plant Based on Fuzzy Logic. <b>2021</b> , 21,	4
332	Autonomous, context-aware, adaptive Digital TwinsBtate of the art and roadmap. 2021, 133, 103508	8
331	Challenges Faced by Businesses in the Mining Industry in the Context of the Industry 4.0 Philosophy. <b>2018</b> , 1, 621-626	1

330	Data-Driven Pattern-Based Constructs Definition for the Digital Transformation Modelling of Collaborative Networked Manufacturing Enterprises. <b>2019</b> , 507-515	2
329	Systems Engineering for Sustainable Mobility. <b>2019</b> , 369-400	
328	K12 ve Lisans Bencilerinin EndBtri 4.0 Kavram∃a DRin AlgEar∃	
327	Study on the Application of Digital Twin Technology in Complex Electronic Equipment. 2020, 172-186	
326	The Characteristics of Digital Twin in Cyberspace: A Knowledge Perspective. 2019,	Ο
325	A Complete Digital Chain to Enable the Digital Twin of a Shop Floor. <b>2020</b> , 128-138	Ο
324	Combination of Information Technology and College English in the Age of Media. 2021, 875-881	
323	Maintenance Strategies Overlook for Devices Under Operation. <b>2020</b> , 50, 111-124	
322	The Design of Intelligent production line for Clothing Industry. <b>2020</b> ,	Ο
321	Data architecture and model design for Industry 4.0 components integration in cyber-physical production systems. 095440542097946	3
320	OUP accepted manuscript.	5
319	Implementation of digital twins in the process industry: A systematic literature review of enablers and barriers. <b>2022</b> , 134, 103558	10
318	Design Thinking and Building Information Modelling. <b>2020</b> , 147-163	1
317	Potential of Integrating Model-Based Design of Experiments Approaches and Process Analytical Technologies for Bioprocess Scale-Down. <b>2021</b> , 177, 1-28	1
316	Digital Shadows as an Enabler for the Internet of Production. <b>2020</b> , 179-186	6
315	Conceptual design driven digital twin configuration. 2020, 67-107	1
314	Analysis of Digital Twins and Application Value of Power Engineering Based on BIM. 2020, 550-558	1
313	SHION: Towards An Interactive Digital Twin Supporting Shopfloor Operations on Real Time. <b>2020</b> , 1-1	О

### (2021-2020)

312	Development of a Predictive Maintenance 4.0 Platform: Enhancing Product Design and Manufacturing. <b>2020</b> , 1039-1049	3
311	DCRRDT: A Method for Deployment and Control of RFID Sensors Under Digital Twin-Driven for Indoor Supervision. <b>2020</b> , 567-576	1
310	Middle of Life Digital Twin: Implementation at a Learning Factory. <b>2020</b> , 116-127	
309	Bayesian Fill Volume Estimation Based on Point Level Sensor Signals. <b>2020</b> , 53, 1261-1267	1
308	Storytelling with Data in the Context of Industry 4.0: A Power BI-Based Case Study on the Shop Floor. <b>2020</b> , 641-651	2
307	The Transformation Towards Smart(er) Factories: Integration Requirements of the Digital Twin. <b>2020</b> , 187-194	
306	Towards a Framework for the Classification of Digital Twins and their Applications. 2021,	1
305	The Current Status and Developing Trends of Industry 4.0: a Review. 1	5
304	Continuous Productivity Improvement Using IoE Data for Fault Monitoring: An Automotive Parts Production Line Case Study. <b>2021</b> , 21,	1
303	Mobile Dual Arm Robots in Cooperation with Humans. <b>2021</b> , 355-372	7
		1
302	A Brief General Industrial Virtual Reality Applications Overview Including a Simple Factory VR Simulation. <b>2021</b> , 723-735	1
302		1
	Simulation. <b>2021</b> , 723-735	
301	Simulation. <b>2021</b> , 723-735  Kalibre. <b>2020</b> ,	1
300	Simulation. 2021, 723-735  Kalibre. 2020,  Digital Twin with a Perspective from Manufacturing Industry. 2021, 27-59  A Data-driven Digital Twin of CNC Machining Processes for Predicting Surface Roughness. 2021,	1 O
301 300 299	Simulation. 2021, 723-735  Kalibre. 2020,  Digital Twin with a Perspective from Manufacturing Industry. 2021, 27-59  A Data-driven Digital Twin of CNC Machining Processes for Predicting Surface Roughness. 2021, 104, 1065-1070  Data-based quality analysis in machining production: Influence of data pre-processing on the	0 2
300 299 298	Simulation. 2021, 723-735  Kalibre. 2020,  Digital Twin with a Perspective from Manufacturing Industry. 2021, 27-59  A Data-driven Digital Twin of CNC Machining Processes for Predicting Surface Roughness. 2021, 104, 1065-1070  Data-based quality analysis in machining production: Influence of data pre-processing on the results of machine learning models. 2021, 104, 869-874  Thermo-fluidic characterization of automotive LiDAR module under realistic enforced air-cooling	1 O 2

294	A Digital Twin Framework and an Implementation Method for Urban Rail Transit. 2021,		1
293	Digital twin-driven complexity management in intelligent manufacturing. 1, 9		1
292	Calibration and Validation of a Cone Crusher Model with Industrial Data. 2021, 11, 1256		О
291	Urban Digital Twins 🖪 FIWARE-based model. <b>2021</b> , 69, 1106-1115		1
290	Knowledge mapping of digital twin and physical internet in Supply Chain Management: A systematic literature review. <b>2021</b> , 108381		10
289	A Framework for Digital Twins for Production Network Management. <b>2021</b> , 104, 1269-1274		3
288	Real-Time Simulator of a Six Degree-of-Freedom Hydraulic Manipulator for Pipe-Cutting Applications. <i>IEEE Access</i> , <b>2021</b> , 9, 153371-153381	3.5	
287	Cyber-Physical Data Fusion in Surrogate-assisted Strength Pareto Evolutionary Algorithm for PHEV Energy Management Optimization. <b>2021</b> , 1-1		4
286	Microgrid Digital Twins: Concepts, Applications, and Future Trends. <i>IEEE Access</i> , <b>2022</b> , 10, 2284-2302	3.5	7
285	Profile of the Business Science Professional for the Industry 4.0. <b>2022</b> , 820-831		
284	Industrial digital twins at the nexus of NextG wireless networks and computational intelligence: A survey. <b>2022</b> , 200, 103309		3
283	Towards fully BIM-enabled building automation and robotics: A perspective of lifecycle information flow. <b>2022</b> , 135, 103570		5
282	Digital twin for sustainable manufacturing supply chains: Current trends, future perspectives, and an implementation framework. <b>2022</b> , 176, 121448		11
281	New digital triad (DT-II) concept for lifecycle information integration of sustainable manufacturing systems. <b>2022</b> , 26, 100316		2
280	Deep learning for assessment of environmental satisfaction using BIM big data in energy efficient building digital twins. <b>2022</b> , 50, 101897		3
279	Review and Prospect of Medical Magnetic-Driven Micro-Nano Robots Based on Equipment Maintenance Concept. <b>2020</b> ,		
278	A Digital Twin Modeling Method for Turbofan Engine Real-time Test Data Analysis and Performance Monitoring. <b>2020</b> ,		1
277	An Explicit Feedback Recommendation Algorithm Based on Subjective and Objective Evaluation Transformation Model. <b>2020</b> ,		O

276	Integrated Planning and Scheduling for Customized Production using Digital Twins and Reinforcement Learning. <b>2021</b> , 54, 408-413	1
275	Quickly and High-Precision Digital Twin Device-Level Simulation Modeling of Permanent Magnet Synchronous Generator and Voltage Stabilizing System. <b>2021</b> ,	
274	Big Data Needs and Challenges in Smart Manufacturing: An Industry-Academia Survey. 2021,	1
273	New Industrial Internet of Things Platform for Predictive Maintenance In Handling Heavy Equipment. <b>2021</b> ,	
272	A Theoretical Analysis Method of Spatial Analytic Geometry and Mathematics under Digital Twins. <b>2021</b> , 2021, 1-14	1
271	Research on the digital twin for thermal characteristics of motorized spindle. <b>2022</b> , 119, 5107	1
270	The role of big data analytics in the context of modeling design and operation of manufacturing systems. <b>2022</b> , 243-275	1
269	Simulation Testing of Maritime Cyber-Physical Systems: Application of Model-View-ViewModel. <b>2022</b> , 2022, 1-14	1
268	Digital twins in manufacturing: systematic literature review for physicaldigital layer categorization and future research directions. 1-27	2
267	Digital Twins in Built Environments: An Investigation of the Characteristics, Applications, and Challenges. <b>2022</b> , 12, 120	13
267 266		13
	Challenges. <b>2022</b> , 12, 120  A bibliometric review of research on digital identity: Research streams, influential works and future	
266	Challenges. 2022, 12, 120  A bibliometric review of research on digital identity: Research streams, influential works and future research paths. 2022, 62, 523-538	1
266 265	Challenges. 2022, 12, 120  A bibliometric review of research on digital identity: Research streams, influential works and future research paths. 2022, 62, 523-538  State-of-the-art survey on digital twin implementations. 2022, 10, 1-23  Blockchain-Based Digital Twins Collaboration for Smart Pandemic Alerting: Decentralized	6
266 265 264	Challenges. 2022, 12, 120  A bibliometric review of research on digital identity: Research streams, influential works and future research paths. 2022, 62, 523-538  State-of-the-art survey on digital twin implementations. 2022, 10, 1-23  Blockchain-Based Digital Twins Collaboration for Smart Pandemic Alerting: Decentralized COVID-19 Pandemic Alerting Use Case 2022, 2022, 7786441  A Novel Implementation Framework of Digital Twins for Intelligent Manufacturing Based on	6
266 265 264 263	Challenges. 2022, 12, 120  A bibliometric review of research on digital identity: Research streams, influential works and future research paths. 2022, 62, 523-538  State-of-the-art survey on digital twin implementations. 2022, 10, 1-23  Blockchain-Based Digital Twins Collaboration for Smart Pandemic Alerting: Decentralized COVID-19 Pandemic Alerting Use Case 2022, 2022, 7786441  A Novel Implementation Framework of Digital Twins for Intelligent Manufacturing Based on Container Technology and Cloud Manufacturing Services. 2022, 1-17  A Conceptual Definition and Future Directions of Urban Smart Factory for Sustainable	1 6 6
266 265 264 263 262	Challenges. 2022, 12, 120  A bibliometric review of research on digital identity: Research streams, influential works and future research paths. 2022, 62, 523-538  State-of-the-art survey on digital twin implementations. 2022, 10, 1-23  Blockchain-Based Digital Twins Collaboration for Smart Pandemic Alerting: Decentralized COVID-19 Pandemic Alerting Use Case 2022, 2022, 7786441  A Novel Implementation Framework of Digital Twins for Intelligent Manufacturing Based on Container Technology and Cloud Manufacturing Services. 2022, 1-17  A Conceptual Definition and Future Directions of Urban Smart Factory for Sustainable Manufacturing. 2022, 14, 1221  Digital Twin-Based Integrated Assessment of Flexible and Reconfigurable Automotive Part	1 6 6 1 3

258	A Study on the Implementation of Virtual Motion Control in Wire Arc Additive Manufacturing Process Using Robot Simulator. <b>2022</b> , 39, 79-85	
257	Digital Twins in the Practice of High-Energy Physics Experiments: A Gas System for the Multipurpose Detector <b>2022</b> , 22,	1
256	Bibliometric analysis of digital twin literature: a review of influencing factors and conceptual structure. 1-15	4
255	Safety Poka Yoke in Zero-Defect Manufacturing Based on Digital Twins. 2022, 1-1	14
254	Intelligent manufacturing execution systems: A systematic review. <b>2022</b> , 62, 503-522	5
253	Digital-twin Healthcare: A Gateway to Future Medicine (Preprint).	
252	To explore the pharmacological mechanism of action using digital twin. <b>2022</b> , 9, 55-62	1
251	Industrial internet of things-driven storage location assignment and order picking in a resource synchronization and sharing-based robotic mobile fulfillment system. <b>2022</b> , 52, 101540	4
250	Manufacturing Execution System as an Integration Backbone for Industry 4.0. 2022, 461-473	О
249	The application of digital twin technology in operations and supply chain management: a bibliometric review. <b>2022</b> , ahead-of-print,	O
248	Unpacking the '15-Minute City' via 6G, IoT, and Digital Twins: Towards a New Narrative for Increasing Urban Efficiency, Resilience, and Sustainability <b>2022</b> , 22,	5
247	Processing Smart Meter Data Using IoT, Edge Computing, and Big Data Analytics. <b>2021</b> , 1-15	1
246	Characterizing the Capabilities of Internet of Things Analytics through Taxonomy and Reference Architecture. <b>2022</b> , 15, 0-0	
245	Digital Procurement. <b>2022</b> , 147-176	
244	A Digital Twin-Driven and Conceptual Framework for Enabling Extended Reality Applications: A Case Study of a Brake Discs Manufacturer. <b>2022</b> , 200, 1885-1893	4
243	The Effect of Intelligent Manufacturing on Remanufacturing Decisions.	
242	A heuristic for internal disruption management in assembly systems. <b>2022</b> , 106, 64-69	
241	Maintenance Digital Twin using vibration data. <b>2022</b> , 200, 546-555	2

240	Implementation of Digital Twin-based Virtual Commissioning in Machine Tool Manufacturing. <b>2022</b> , 200, 527-536	1
239	Digital Twin Perspective of Fourth Industrial and Healthcare Revolution. <i>IEEE Access</i> , <b>2022</b> , 10, 25732-25354	6
238	Industry 4.0 implementation sequence for manufacturing companies. 1	0
237	A review of digital twin applications in construction. <b>2022</b> , 27, 145-172	2
236	Digital Twin and Smart Manufacturing in Industries: A Bibliometric Analysis with a Focus on Industry 4.0 <b>2022</b> , 22,	3
235	Artificial intelligence-based method for forecasting flowtime in job shops. 2022, ahead-of-print,	
234	Analyzing the Implementation of a Digital Twin Manufacturing System: Using a Systems Thinking Approach. <b>2022</b> , 10, 22	2
233	Digital Twintyber Replica of Physical Things: Architecture, Applications and Future Research Directions. <b>2022</b> , 14, 64	4
232	A Digital Twin Approach for Improving Estimation Accuracy in Dynamic Thermal Rating of Transmission Lines. <b>2022</b> , 15, 2254	1
231	The key technologies of machining process design: a review. 1	
230	Digital Twin-Based Automated Guided Vehicle Scheduling: A Solution for Its Charging Problems. <b>2022</b> , 12, 3354	1
229	Towards an Intelligent Digital Cabin Twin to Support an Aircraft's Retrofit and Base Maintenance (SAE Paper 2022-01-0046).	1
228	Review of Semiconductor Flash Memory Devices for Material and Process Issues <b>2022</b> , e2200659	5
227	Analyzing cathode and anode spot movements of atmospheric arc plasma in parallel electrodes using thermal field theory and thermal nonequilibrium model.	1
226	Digital Twins About Humans - Design Objectives From Three Projects. 1-10	1
225	Design and implementation of a smart infrastructure digital twin. <b>2022</b> , 136, 104171	4
224	Convolutional neural networks for prediction of geometrical errors in incremental sheet metal forming. 1	0
223	A Digital Twin predictive maintenance framework of air handling units based on automatic fault detection and diagnostics. <b>2022</b> , 261, 111988	4

222	People-centered distributed ledger technology-IoT architectures: A systematic literature review. <b>2022</b> , 70, 101812	2
221	An Integrated Platform for Multi-Model Digital Twins. 2021,	1
220	IoT Approach for Intelligent Data Acquisition for Enabling Digital Twins in the Railway Sector. 2021,	1
219	Blockchain Checksum for Establishing Secure Communications for Digital Twin Technology. <b>2021</b> ,	
218	Facilitating Role of Cloud Computing in Driving Big Data Emergence. 2021,	O
217	A Digital Twin Based Design of the Semi-physical Marine Engine Room Simulator for Remote Maintenance Assistance. <b>2021</b> ,	
216	Product Development in the Automotive Industry in the Context of Industry 4.0 - A Bibliometric Analysis. <b>2021</b> ,	
215	Big data analytics opportunities for applications in process engineering. 2020,	1
214	Digital Triplet of a Industrial Multistage Centrifugal Pump. <b>2021</b> ,	
213	A Distinctive Real-time Information for Industries and New Business Opportunity Analysis Offered by SAP and AnyLogic Simulation. <b>2021</b> ,	1
212	Industry 4.0: A Proposal of Paradigm Organization Schemes from a Systematic Literature Review <b>2021</b> , 22,	1
211	BETA CONVERGENCE ANALYSIS OF GROSS VALUE ADDED IN THE HIGH-TECHNOLOGY MANUFACTURING INDUSTRIES. <b>2021</b> , 28, 290-312	1
210	Improvement of Quantum Approximate Optimization Algorithm for Max-Cut Problems 2021, 22,	О
209	Design and Development of a Digital Twin Dashboards System Under Cyber-physical Digital Twin Environment. <b>2021</b> ,	Ο
208	When Digital Twin Meets Network Softwarization in the Industrial IoT: Real-Time Requirements Case Study <b>2021</b> , 21,	1
207	Understanding the role and capabilities of Internet of Things-enabled Additive Manufacturing through its application areas. <b>2021</b> ,	1
206	A multi-agent and internet of things framework of digital twin for optimized manufacturing control. 1-22	2
205	Research on Network Management Technology of Power Line Carrier Communication in Low-Voltage Distribution Network Based on Digital Twin. <b>2021</b> ,	O

204	Knowledge mapping of research on Industry 4.0: A visual analysis using CiteSpace. <b>2022</b> , 17, 125-143	
203	The role of environmental studies in driving automation and digital transformation. <b>2022</b> , 121-160	
202	Application of image recognition technology in digital twinning technology: Taking tangram splicing as an example. 2, 6	
201	Digital Twin Applications: A Survey of Recent Advances and Challenges. <b>2022</b> , 10, 744	O
200	Towards smart production planning and control; a conceptual framework linking planning environment characteristics with the need for smart production planning and control. <b>2022</b> ,	O
199	A digital twin ecosystem for additive manufacturing using a real-time development platform <b>2022</b> , 120, 1-17	1
198	Digital Twin: A Comprehensive Survey of Security Threats. <b>2022</b> , 1-1	7
197	Digital Twin and Data-driven Quality Prediction of Complex Die-casting Manufacturing. 2022, 1-1	O
196	Digital Twin Technologies, Architecture, and Applications: A Comprehensive Systematic Review and Bibliometric Analysis. <b>2022</b> , 105-142	1
195	Deep Learning-Assisted Smart Process Planning, Robotic Wireless Sensor Networks, and Geospatial Big Data Management Algorithms in the Internet of Manufacturing Things. <b>2022</b> , 11, 277	12
194	Dynamic flow scheduling optimization based on intelligent control for digital twins.	
193	Autonomous Digital Twin of Enterprise: Method and Toolset for Knowledge-Based Multi-Agent Adaptive Management of Tasks and Resources in Real Time. <b>2022</b> , 10, 1662	
192	Quantum cyber-physical systems <b>2022</b> , 12, 7964	0
191	Development of a Digital Model of Mining Face of Coal Mine. <b>2021</b> , 57, 659-667	O
190	Real-time resilient scheduling by digital twin technology in a flow-shop manufacturing system. <b>2022</b> , 107, 668-674	0
189	Developing a Web-Based BIM Asset and Facility Management System of Building Digital Twins. <b>2022</b> ,	
188	Enabling Improved Learning Capability of Industrial Robots with Knowledge Graph Towards Intelligent Digital Twins. <b>2022</b> ,	O
187	Digital twin campus with a novel double-layer collaborative filtering recommendation algorithm framework.	Ο

186	Towards digital shadows for production planning and control in injection molding. 2022, 38, 243-251		3
185	Guidance for Materials 4.0 to interact with a digital twin. <b>2022</b> , 3,		2
184	Digital Twins for Distributed Intelligent Sensing and Control Systems. 2022, 119-130		O
183	About Perfection of Digital Twin Models. <b>2022</b> , 91-101		2
182	Literature review on using data mining in production planning and scheduling within the context of cyber physical systems. <b>2022</b> , 100371		O
181	Applications of Digital Twin across Industries: A Review. <b>2022</b> , 12, 5727		8
180	Two-step residual-error based approach for anomaly detection in engineering systems using variational autoencoders. <b>2022</b> , 101, 108065		O
179	Blockchain in construction management: Applications, advantages and limitations. <b>2022</b> , 140, 104379		3
178	The Analysis of Business Processes. <b>2022</b> , 13-35		
177	Empirical Insights into the Challenges of Implementing Digital Twins. <b>2022</b> , 229-239		
177 176	Empirical Insights into the Challenges of Implementing Digital Twins. 2022, 229-239  A Collaborative Industrial Augmented Reality Digital Twin: Developing the Future of hipyard 4.0. 2022, 104-120		1
	A Collaborative Industrial Augmented Reality Digital Twin: Developing the Future of Shipyard 4.0.	3.5	1 3
176	A Collaborative Industrial Augmented Reality Digital Twin: Developing the Future of Shipyard 4.0. 2022, 104-120  Industrial Internet of Things: Requirements, Architecture, Challenges, and Future Research	3.5	
176 175	A Collaborative Industrial Augmented Reality Digital Twin: Developing the Future of hipyard 4.0. 2022, 104-120  Industrial Internet of Things: Requirements, Architecture, Challenges, and Future Research Directions. IEEE Access, 2022, 1-1  A Digital Twin Platform-Based Approach to Product Lifecycle Management: Towards a Transformer	3.5	
176 175 174	A Collaborative Industrial Augmented Reality Digital Twin: Developing the Future of Shipyard 4.0. 2022, 104-120  Industrial Internet of Things: Requirements, Architecture, Challenges, and Future Research Directions. <i>IEEE Access</i> , 2022, 1-1  A Digital Twin Platform-Based Approach to Product Lifecycle Management: Towards a Transformer 4.0. 2023, 14-25	3.5	3
176 175 174	A Collaborative Industrial Augmented Reality Digital Twin: Developing thell Future of Shipyard 4.0. 2022, 104-120  Industrial Internet of Things: Requirements, Architecture, Challenges, and Future Research Directions. IEEE Access, 2022, 1-1  A Digital Twin Platform-Based Approach to Product Lifecycle Management: Towards a Transformer 4.0. 2023, 14-25  Industry 4.0 Technologies for Maintenance Management An Overview. 2023, 68-79	3.5	3
176 175 174 173	A Collaborative Industrial Augmented Reality Digital Twin: Developing thelFuture of Shipyard 4.0. 2022, 104-120  Industrial Internet of Things: Requirements, Architecture, Challenges, and Future Research Directions. IEEE Access, 2022, 1-1  A Digital Twin Platform-Based Approach to Product Lifecycle Management: Towards a Transformer 4.0. 2023, 14-25  Industry 4.0 Technologies for Maintenance Management IAn Overview. 2023, 68-79  Digital twin rehabilitation system based on self-balancing lower limb exoskeleton. 2022, 1-13	3.5	0

168	Reorganizing Industry 4.0 Paradigms for Successful Execution of Digital Transformation Strategies. <b>2022</b> , 133-145	
167	The Virtual Geographic Environments: More than the Digital Twin of the Physical Geographical Environments. <b>2022</b> , 17-28	О
166	Enabling Digital Twins in Industry 4.0. <b>2022</b> , 465-488	
165	Survey on digital twins for Internet of Vehicles: Fundamentals, challenges, and opportunities. 2022,	1
164	Implementation of a holistic digital twin solution for design prototyping and virtual commissioning.	
163	Common Educational Teleoperation Platform for Robotics Utilizing Digital Twins. 2022, 10, 577	1
162	An evaluation method using virtual reality to optimize ergonomic design in manual assembly and maintenance scenarios.	1
161	Implementation of Cross-Industrial Networks Targeting CO 2 Reduction from a Systemic Approach.	
160	Quality process reengineering in industry 4.0: A BPR perspective. 1-20	
159	The Digital Twin in Medicine: A Key to the Future of Healthcare?. 9,	2
159 158	The Digital Twin in Medicine: A Key to the Future of Healthcare?. 9,  Digital Twin Technology [A bibliometric study of top research articles based on Local Citation Score. 2022, 64, 390-408	<b>2</b> O
	Digital Twin Technology IA bibliometric study of top research articles based on Local Citation	
158	Digital Twin Technology [A bibliometric study of top research articles based on Local Citation Score. 2022, 64, 390-408  Supply Chain 4.0 performance measurement: A systematic literature review, framework	О
158	Digital Twin Technology IA bibliometric study of top research articles based on Local Citation Score. 2022, 64, 390-408  Supply Chain 4.0 performance measurement: A systematic literature review, framework development, and empirical evidence. 2022, 164, 102725  Physics-based modeling and information-theoretic sensor and settings selection for tool wear	0
158 157 156	Digital Twin Technology IA bibliometric study of top research articles based on Local Citation Score. 2022, 64, 390-408  Supply Chain 4.0 performance measurement: A systematic literature review, framework development, and empirical evidence. 2022, 164, 102725  Physics-based modeling and information-theoretic sensor and settings selection for tool wear detection in precision machining. 2022, 81, 127-140  Towards Civil Engineering 4.0: Concept, workflow and application of Digital Twins for existing	O 2 O
158 157 156	Digital Twin Technology IA bibliometric study of top research articles based on Local Citation Score. 2022, 64, 390-408  Supply Chain 4.0 performance measurement: A systematic literature review, framework development, and empirical evidence. 2022, 164, 102725  Physics-based modeling and information-theoretic sensor and settings selection for tool wear detection in precision machining. 2022, 81, 127-140  Towards Civil Engineering 4.0: Concept, workflow and application of Digital Twins for existing infrastructure. 2022, 141, 104421  The Adoption of Industry 4.0 Technologies: Its Benefits for Companies in the Brazilian Automotive	O 2 O
158 157 156 155	Digital Twin Technology IA bibliometric study of top research articles based on Local Citation Score. 2022, 64, 390-408  Supply Chain 4.0 performance measurement: A systematic literature review, framework development, and empirical evidence. 2022, 164, 102725  Physics-based modeling and information-theoretic sensor and settings selection for tool wear detection in precision machining. 2022, 81, 127-140  Towards Civil Engineering 4.0: Concept, workflow and application of Digital Twins for existing infrastructure. 2022, 141, 104421  The Adoption of Industry 4.0 Technologies: Its Benefits for Companies in the Brazilian Automotive Sector. 2022, 140-160	O 2 O

Proposal of an IoT Architecture for Greenhouse Monitoring. 2022,

149	Digital Twin-Enabled AI Enhancement in Smart Critical Infrastructures for 5G.	O
148	Digital Twin and Its Implementation in 3D Printing: A Research Review. <b>2022</b> , 10, 49-68	
147	Towards real time monitoring of an aeronautical machining process using scalable technologies. <b>2022</b> ,	
146	Digital twin applications in aviation industry: A review. <b>2022</b> , 121, 5677-5692	4
145	Smart manufacturing and sustainability: a bibliometric analysis.	1
144	A Metaheuristic Optimization Algorithm for energy efficiency in Digital Twins. 2022,	1
143	Digital Twins: State of the art theory and practice, challenges, and open research questions. <b>2022</b> , 100383	6
142	Fault Diagnosis of Permanent Magnet Synchronous Motor of Coal Mine Belt Conveyor Based on Digital Twin and ISSA-RF. <b>2022</b> , 10, 1679	0
141	Impactful Digital Twin in the Healthcare Revolution. <b>2022</b> , 6, 83	6
140	Digital twin-based job shop anomaly detection and dynamic scheduling. <b>2023</b> , 79, 102443	О
139	Applying digital twins for the management of information in turnaround event operations in commercial airports. <b>2022</b> , 54, 101723	O
138	A conceptual framework for smart production planning and control in Industry 4.0. <b>2022</b> , 173, 108659	2
137	A digital twin approach for tunnel construction safety early warning and management. <b>2023</b> , 144, 103783	2
136	Digital Twins from a Networking Perspective. <b>2022</b> , 1-1	О
135	Building Digital Shadows for Production Control. <b>2022</b> , 110-117	O
134	Fusion of Building Information Modeling and Blockchain for Metaverse: A Survey. 2022, 1-13	2
133	Has enterprise digital transformation improved the efficiency of enterprise technological innovation? A case study on Chinese listed companies. <b>2022</b> , 19, 12632-12654	9

132	Application and Uses of Big Data Analytics in Different Domain. 2022, 481-500	О
131	Concepts and Challenges for DD Point Clouds as Foundation of Conscious, Smart City Systems. <b>2022</b> , 589-605	0
130	Concept of hybrid modeled digital twins and its application for an energy management of manufacturing systems. <b>2022</b> , 112, 549-554	0
129	Overview of Emerging Technologies for Improving the Performance of Heavy-Duty Construction Machines. <b>2022</b> , 10, 103315-103336	O
128	Improved Electric Vehicle Digital Twin Performance Incorporating Detailed Lithium-ion Battery Model. <b>2022</b> ,	0
127	A DT-Based System for Predicting Process Behavior. <b>2023</b> , 245-251	Ο
126	Digital Twin Assistant Active Design and Optimization of Steel Mega-Sub Controlled Structural System under Severe Earthquake Waves. <b>2022</b> , 15, 6382	Ο
125	Demystifying xAOSF/AOSR Framework in[the Context of Digital Twin and Industry 4.0. <b>2023</b> , 600-610	O
124	The Impact of Intelligent Objects on Quality 4.0. <b>2023</b> , 287-298	О
123	A RESEARCH ON DIGITAL TRANSFORMATION EXECUTIONS IN TURKISH CONSTRUCTION INDUSTRY. <b>2022</b> , 10, 973-986	Ο
122	Facing Environmental Goals for Energy-Efficiency Improvements in Micro and Small Enterprises Operating in the Age of Industry 4.0. <b>2022</b> , 15, 6577	0
121	Industry 4.0 Implementation Framework for the Composite Manufacturing Industry. <b>2022</b> , 6, 258	Ο
120	TCM Physical Health Management Training and Nursing Effect Evaluation Based on Digital Twin. <b>2022</b> , 2022, 1-13	0
119	Evolution of Knowledge Structure in an Emerging Field Based on a Triple Helix Model: the Case of Smart Factory.	O
118	Optimal Management of Computer Network Security in the Era of Big Data. <b>2022</b> , 2022, 1-10	Ο
117	Disruptive Innovation in Mining Industry 4.0. <b>2022</b> , 313-325	2
116	Efficient Procedure of Building University Campus Models for Digital Twin Simulation. 2022, 1-1	0
115	An Artificial Intelligence-based Pick-and-Place Process Control for Quality Enhancement in Surface Mount Technology. <b>2022</b> , 1-1	O

114	Extension of the CCMS 2.0 maturity model towards Artificial Intelligence. <b>2022</b> , 55, 293-298	О
113	Key Research Challenges in Digital Twin Applications for Demanufacturing. <b>2022</b> , 55, 2551-2556	Ο
112	Enabling Digital Twins to Support the UN SDGs. <b>2022</b> , 6, 115	0
111	What Is a Digital Twin? Experimental Design for a Data-Centric Machine Learning Perspective in Health. <b>2022</b> , 23, 13149	O
110	Knowledge Graphs Ontologies and Applications for Energy Efficiency in Buildings: A Review. <b>2022</b> , 15, 7520	O
109	Human knowledge centered maintenance decision support in digital twin environment. <b>2022</b> , 65, 528-537	1
108	Research on main bearing life prediction of direct-drive wind turbine based on digital twin technology.	1
107	Data-driven engineering design: A systematic review using scientometric approach. <b>2022</b> , 54, 101774	O
106	Developing a 3D City Digital Twin: Enhancing Walkability through a Green Pedestrian Network (GPN) in the City of Imola, Italy. <b>2022</b> , 11, 1917	1
105	Digital Twin of HVAC system (HVACDT) for multiobjective optimization of energy consumption and thermal comfort based on BIM framework with ANN-MOGA. 1-49	O
104	Core Ontology for Describing Production Equipment According to Intelligent Production. <b>2022</b> , 5, 98	0
103	Development of a Framework to Support Whole-Life-Cycle Net-Zero-Carbon Buildings through Integration of Building Information Modelling and Digital Twins. <b>2022</b> , 12, 1747	O
102	Digital Twin in smart manufacturing: remote control and virtual machining using VR and AR technologies. <b>2022</b> , 65,	1
101	Industrial internet of things in intelligent manufacturing: a review, approaches, opportunities, open challenges, and future directions.	1
100	A standardized approach for measuring the performance and flexibility of digital twins. 1-16	3
99	Digital Twin for 6G: Taxonomy, Research Challenges, and the Road Ahead. <b>2022</b> , 1-1	2
98	Accurate and Efficient Digital Twin Construction Using Concurrent End-to-End Synchronization and Multi-Attribute Data Resampling. <b>2022</b> , 1-1	О
97	Digital Twin and Big Data in Healthcare. <b>2022</b> ,	O

96	Towards electric digital twin grid: Technology and framework review. 2022, 100213	O
95	A review of the Digital Twin technology for fault detection in buildings. 8,	1
94	Modeling and simulation of smart grid-aware edge computing federations.	0
93	Toward a function realization of multi-scale modeling for lithium-ion battery based on CHAIN framework.	O
92	Adoption of modern technologies for implementing industry 4.0: an integrated MCDM approach.	0
91	HCI and Digital Twins 🖪 Critical Look. <b>2022</b> ,	O
90	Mist and Edge Computing Cyber-Physical Human-Centered Systems for Industry 5.0: A Cost-Effective IoT Thermal Imaging Safety System. <b>2022</b> , 22, 8500	2
89	Compressive sampling - based extrapolation of free surface displacement data from pressure measurements. <b>2022</b> , 266, 113044	O
88	Digital Twin Driven Reconfiguration of Li-ion Batteries with Capacity Delivery Maximization. 2022,	0
87	Digital twin and its applications: A survey.	1
86	Digital twin and its applications: A survey.  Digital twins and land management in South Korea. 2023, 124, 106442	0
86	Digital twins and land management in South Korea. <b>2023</b> , 124, 106442  Civil Infrastructure Digital Twins: Multi-Level Knowledge Map, Research Gaps, and Future	0
86	Digital twins and land management in South Korea. 2023, 124, 106442  Civil Infrastructure Digital Twins: Multi-Level Knowledge Map, Research Gaps, and Future Directions. 2022, 10, 122022-122037  Knowledge map and forecast of digital twin in the construction industry: State-of-the-art review	0
86 85 84	Digital twins and land management in South Korea. 2023, 124, 106442  Civil Infrastructure Digital Twins: Multi-Level Knowledge Map, Research Gaps, and Future Directions. 2022, 10, 122022-122037  Knowledge map and forecast of digital twin in the construction industry: State-of-the-art review using scientometric analysis. 2023, 383, 135231	0 2
86 85 84 83	Digital twins and land management in South Korea. 2023, 124, 106442  Civil Infrastructure Digital Twins: Multi-Level Knowledge Map, Research Gaps, and Future Directions. 2022, 10, 122022-122037  Knowledge map and forecast of digital twin in the construction industry: State-of-the-art review using scientometric analysis. 2023, 383, 135231  Modeling Methods of 3D Model in Digital Twins. 2023, 1-38	O 2 O
86 85 84 83 82	Digital twins and land management in South Korea. 2023, 124, 106442  Civil Infrastructure Digital Twins: Multi-Level Knowledge Map, Research Gaps, and Future Directions. 2022, 10, 122022-122037  Knowledge map and forecast of digital twin in the construction industry: State-of-the-art review using scientometric analysis. 2023, 383, 135231  Modeling Methods of 3D Model in Digital Twins. 2023, 1-38  Simplexity testbed: A model-based digital twin testbed. 2023, 145, 103804	O 2 O O

78	Gearbox fault diagnosis based on a fusion model of virtual physical model and data-driven method. <b>2023</b> , 188, 109980	0
77	Digital Twins Collaboration in Industrial Manufacturing. <b>2022</b> , 59-72	О
76	Defining Cases and Variants for Object-Centric Event Data. 2022,	2
75	Eetim Planlama ve Kontrol SEeLerinde Dijital Liz Teknolojisinin KullanEmasETekstil SektEElde Bir Uygulama.	O
74	Role of Digital Twin Technology in Medical Sector Toward Ensuring Safe Healthcare. 2022, 77-95	0
73	A Digital Twin Model of Three-Dimensional Shading for Simulation of the Ironmaking Process. <b>2022</b> , 10, 1122	o
72	Substation Digital Twin Framework Design and Key Technology Research. 2022,	0
71	A comprehensive review of digital twin part 1: modeling and twinning enabling technologies. <b>2022</b> , 65,	3
70	Smart Factory Framework. <b>2023</b> , 33-229	0
69	Holistic Security and Safety for Factories of the Future. <b>2022</b> , 22, 9915	o
68	An Integrated Digital Twin Simulation and Scheduling System under Cyber-physical Digital Twin Environment. <b>2022</b> ,	0
67	Digital Twins Utilizing XR-Technology as Robotic Training Tools. <b>2023</b> , 11, 13	О
66	An Analysis of the Literature on Industry 4.0 and the Major Technologies. 2023, 19-39	0
65	Advances in Smart Maintenance for Sustainable Manufacturing in Industry 4.0. <b>2023</b> , 97-123	О
64	Industry 4.0 concepts within the subBaharan African SME manufacturing sector. <b>2023</b> , 217, 846-855	0
63	Deep Learning-Based Adaptive Compression and Anomaly Detection for Smart B5G Use Cases Operation. <b>2023</b> , 23, 1043	О
62	Enhancing Innovation Via the Digital Twin.	0
61	Surface modification technologies for enhancing the tribological properties of cemented carbides: A Review. <b>2023</b> , 108257	О

60	Digital Twin and Extended Reality: Strategic Approach and Practical Implementation. 2023, 853-880	О
59	Exploring advanced process equipment visualization as a step towards digital twins development in the chemical industry: A CFD-DNN approach. <b>2023</b> , 40, 37-45	O
58	End-to-End Architectures for Data Monetization in the Industrial Internet of Things (IIoT). 2023, 149-183	O
57	Data Modeling and ML Practice for Enabling Intelligent Digital Twins in Adaptive Production Planning and Control. <b>2023</b> , 217, 1908-1917	O
56	Industrial internet of things (IIoT): opportunities, challenges, and requirements in manufacturing businesses in emerging economies. <b>2023</b> , 217, 856-865	О
55	Digital Technologies in Offsite and Prefabricated Construction: Theories and Applications. <b>2023</b> , 13, 163	О
54	Proposing a Small-Scale Digital Twin Implementation Framework for Manufacturing from a Systems Perspective. <b>2023</b> , 11, 41	О
53	Analytical Design of Optimal Fractional Order PID Control for Industrial Robot based on Digital Twin. <b>2022</b> ,	O
52	A Review on Digital Twin for Robotics in Smart Manufacturing. 2022,	O
51	Research on railway cooperative test platform and key technologies based on digital twin. 2022,	O
50	Data-Based Digital Twin of an Automated Guided Vehicle System. 2022,	1
49	Exploring Building Information Modeling (BIM) and Internet of Things (IoT) Integration for Sustainable Building. <b>2023</b> , 13, 288	O
48	Digital Twin-Based Automated Fault Diagnosis in Industrial IoT Applications. 2023, 75, 183-196	O
47	Relationship between digital twin and building information modeling: a systematic review and future directions.	O
46	The Development, Coupling Degree, and Value-Added Capability of the Digital Economy and Manufacturing Industry in China. <b>2023</b> , 11, 52	О
45	Digital Twin Applications in Spacecraft Protection. <b>2023</b> , 283-294	O
44	Product-part level digital twin modeling method for digital thread framework. <b>2023</b> , 179, 109168	О
43	Digital twin in battery energy storage systems: Trends and gaps detection through association rule mining. <b>2023</b> , 273, 127086	O

42	Digital twinning of civil infrastructures: Current state of model architectures, interoperability solutions, and future prospects. <b>2023</b> , 149, 104785	О
41	Digital Twin: Benefits, use cases, challenges, and opportunities. <b>2023</b> , 6, 100165	O
40	Information systems engineering with Digital Shadows: Concept and use cases in the Internet of Production. <b>2023</b> , 114, 102182	О
39	Citizen Participation and Knowledge Support in Urban Public Energy Transition Quadruple Helix Perspective. <b>2023</b> , 12, 395	2
38	Is digital transformation equally attractive to all manufacturers? Contextualizing the operational and customer benefits of smart manufacturing.	O
37	Industry 5.0 or industry 4.0S? Introduction to industry 4.0 and a peek into the prospective industry 5.0 technologies. <b>2023</b> , 17, 947-979	O
36	Critical Success Factors for Internet of Things (IoT) Implementation in Automotive Companies, Indonesia. <b>2023</b> , 15, 2909	0
35	Fast prediction of turbine energy acquisition capacity under combined action of wave and current based on digital twin method. 1-15	O
34	Cut the peaches: image segmentation for utility pattern mining in food processing. 2022,	0
33	Digital-Twin-Based Real-Time Optimization for a Fractional Order Controller for Industrial Robots. <b>2023</b> , 7, 167	O
32	A digital twindriven monitoring framework for dual-robot collaborative manipulation. 2023, 125, 4579-4599	0
31	Experience from implementing digital twins for maintenance in industrial processes.	O
30	A Survey on the Use of Lightweight Virtualization in I4.0 Manufacturing Environments. 2023, 31,	0
29	The Application and Research of New Digital Technology in Marine Aquaculture. 2023, 11, 401	O
28	The titans sustainability and industry 4.0 working for the planet earth. 2023, 14, 1953-1965	0
27	Integration of Blockchain and Digital Twins in the Smart Built Environment Adopting Disruptive Technologies A Systematic Review. <b>2023</b> , 15, 3713	O
26	Ontological support system of managerial decision-making of production tasks for a food enterprise. <b>2022</b> , 13,	0
25	Proposal of Mapping Digital Twins Definition Language to Open Platform Communications Unified Architecture. <b>2023</b> , 23, 2349	Ο

24	Digital Twin for Image-Based Particle Pollutant Matter Prognosis. 2023, 104, 351-357	0
23	Design of a Digital Twin for Spacecraft Network System. <b>2022</b> ,	O
22	An Overview of Digital Twins Application in Smart Energy Grids. 2022,	0
21	The effect of intelligent manufacturing on remanufacturing decisions. 2023, 178, 109114	O
20	Systematic Review: Implementation of Product Lifecycle Management in Industries. 2023, 263-279	O
19	The realm of metaverse: A survey.	O
18	From simple digital twin to complex digital twin part II: Multi-scenario applications of digital twin shop floor. <b>2023</b> , 56, 101915	O
17	A Digital Twin-Based State Monitoring Method of Gear Test Bench. <b>2023</b> , 13, 3291	1
16	Research on gas pipeline leakage model identification driven by digital twin. 2023, 11,	O
15	Digital Twin Background. <b>2023</b> , 1-21	O
14	Architectural Reply for Smart Building Design Concepts Based on Artificial Intelligence Simulation Models and Digital Twins. <b>2023</b> , 15, 4955	O
13	Methodology for the Development of Virtual Representations within the Process Development Framework of Energy Plants: From Digital Model to Digital Predictive Twin Review. <b>2023</b> , 16, 2641	O
12	Leveraging the Role of Dynamic Reconfigurable Antennas in Viewpoint of Industry 4.0 and Beyond. <b>2023</b> , 6,	О
11	Digital Twins along the product lifecycle: A systematic literature review of applications in manufacturing. 3, 3	O
10	Digital Twin: Is It Hype?. <b>2023</b> , 81-93	0
9	Virtual Prototyping for Modern Internet-of-Things Applications: A Survey. <b>2023</b> , 11, 31384-31398	O
8	Roughness prediction of end milling surface for behavior mapping of digital twined machine tools. 3, 4	О
7	The Metaverse evolution: Toward Future Digital Twin Campuses. 2022,	O

6	Digital Twin in Construction. <b>2023</b> , 249-267	0
5	Digital Twin Ancient Architecture: The Exploration of the Digital Protection of Ancient Architecture. <b>2023</b> , 537-546	О
4	Digital twin inception in the Era of industrial metaverse. 3,	О
3	The fusion of data visualisation and data analytics in the process of mining digitalisation. 2023, 1-1	O
2	A Systematic Review of Data Quality in CPS and IoT for Industry 4.0.	O
1	Empowering End-of-Life Vehicle Decision Making with Cross-Company Data Exchange and Data Sovereignty via Catena-X. <b>2023</b> , 15, 7187	O