International Journal of Engineering Sciences & Emerging Technologies, Oct. 2023.
ISSN: 22316604 Volume 11, Issue 2, pp: 248-256 ©IJESET

A REVIEW OF AUTOMATION TECHNOLOGY

Pankaj Kumar Dubey, Bindeshwar Singh, Deependra Singh
Department of Electrical Engineering, Kamla Nehru Institute of Technology, Sultanpur, U.P, India
pankajdubeysangamboy@gmail.com
bindeshwar.singh2025@gmail.com
deependra_knit@yahoo.com

ABSTRACT

The focus of the world has switched to technological advancements that improve automation, efficiency, and stability. These autonomous technologies simplify and enhance the performance of any procedure. Analyzed the literature providing informatics systems that assist or automate the systematic review's procedures or each of its functions. Numerous initiatives concentrate on automating, simplification, and/or expediting particular systematic review activities. While other tasks still rely heavily on physical labor, some have already been automated. This review paper reviewed the most recent developments in the field of automation technology research. In addition to future scope, this study also discusses the automation technology market scenario. The review paper's major objective is to introduce new researchers to automated technologies.

KEYWORDS: *Cyber security, Fault detection, Industrial Automation, Smart grid, Smart home.*

1. INTRODUCTION

Companies are shifting toward automation as a result of recent technological advancements and the use of computers. When a task is accomplished with a better level of certainty and efficiency thanks to software or robotics, it is said to have been automated. The automation of companies enables them to create more things in a given amount of time with better quality and precision. Workers' wages are also reduced through automation. Industrial automation, as a broad field of technology, refers to knowledge gathering and industry analysis of assessment, modification, etc., without direct manual operation, by anticipated goals in mechanical apparatus or manufacturing techniques.

Through self-diagnosis, self-correction, and a variety of operational software, manufacturing automated technology makes machinery smarter in this mode, better assisting workers to finish output. In the automation industry, there has been a gradual movement in perspective over the past few years toward viewing protection as a crucial necessity on par with dependability or safety [32]. Automobile automation that can free the operator from the responsibility of operating the automobile is still being developed. The assisted automotive automation that is now found in automobiles that are on the market needs the operator to be in complete control of the driving process at all times. This type of uncontrolled driverless vehicle is different from that.

Since the 1930s, the automobile mortality rate per 100 million miles traveled in the United States has reduced from 15.0 to 1.5, still showing more than 35,000 deaths annually. This statistic can be used to demonstrate how electric drivetrains, facilities, and social rules have influenced pedestrian safety over the years. Vehicle automation holds the potential of removing 94% of these collisions, which would result in a road accident rate of 0.075, or 1,750 deaths. However, automation frequently creates additional common mistakes where it eliminated other mistake types. Among almost any industrial organization today, executive management must address the basic issue of digitalization. Current developments in wireless technology solutions, such as cloud coding, visualization tools, the Industrial Internet of Things (I-IoT), additive manufacturing, big data, actionable insights, artificial intelligence, blockchain techniques, and autonomous automatic vehicles, have made it more affordable for firms to build digitization.

Through the use of these techniques, the cyber-physical linkage has been made possible, enabling data gathering, interpretation, and visualization to support informed decision-making and, ultimately, optimize production lines [33].

Merits: Automation makes it simple to do tasks that are challenging for participants to achieve. In situations where human interaction is risky, automated machinery is useful. It lowers labor costs and labor force. Precise jobs can be performed, and final items have high accuracy. Considerably cuts down on the amount of effort. Complicated tasks can be completed rapidly and effortlessly. The labor deficit that plagues many developed countries is lessened by automation.

Demerits: Automation causes heavy machinery to take the position of laborers, highly jobless. The upfront costs of automating the sector are very expensive, and service costs are higher. All activities cannot yet be automated with the present tech.

2. CURRENT ADVANCES IN AUTOMATION TECHNOLOGICAL INNOVATION

Effects of cultural, openness, faith, and automated level on the application of automation [1]. The applicability of wireless networks for industrial automation-factory automation (WIA-FA) to the digital workplace: An automated manufacturing using a wireless connection [2]. Model-driven engineering and design methodology for automated solutions [3]. Utilizing smart electricity management, automate your house [4]. Augmentation of information focused on social signals with an emphasis on social mobility [5]. A probabilistic platform for automated designing: ArduCode [6]. Prioritizing network test scenarios in process automation with business applicability [7]. The Impact of the automated period, testing route, and timeframes on the aftermaths of automation [8]. Structure controlling and management systems intrusion monitoring systems [9]. The Catering industry has been dominated by the epidemic, and skilled machines are automating takeout services [10].

A failure mode effect analysis-based judgment support network for networked automated systems that self-heals [11]. The architecture of an intelligent residence with an automation system is supported by the Internet of Things [12]. 802.11n for industrial automation depending on NOMA [13]. A contrast between free and open-source home automation programs [14]. Energy administration automated interaction architecture for microgrids [15]. Customer home management system energy usage: being "smart" is indeed not free [16]. For automated systems and wireless sensors, semantics devices, and system modeling [17]. A processed manufactured system's functionality is being monitored using a digital twin and free automation process [18]. A viewpoint for industrial telecommunication and automotive industries using IEEE time-sensitive connectivity [19]. Automatically controlling flow extraction from decentralized smart grid automating controlling demands [20].

Towards Energy-Efficient Connectivity in Embedded Device Intelligent Automated Systems, Approaching 6G Infrastructure [21]. Understanding and communication between automated vehicles as well as other road users: concept and mechanism [22]. Implementing Dynamic and Participatory Software Solutions for Technology and Automation [23]. Distributing Systems Engineering Cyber - attacks Monitoring and Reduction Using Multi-Agent Technology [24]. In substation automated systems, outlier detection for insider threats from unreliable smart objects [25]. For the Industrial Internet of Things, distributed robotics is used [26]. Understanding and communication between automated vehicles and other road users: theory and mechanisms [27]. Collaborative steering management for adaptable driver mechanization using forearm area electromyography monitoring [28]. Automation and optimization for smart home technologies that are human-centric [29]. SAR ADCs in the IoT: A Mixed Circuit Design Tool, [30].

Table 1 (a): Analysis of the application of automation technology

Ref. No.	Author	Pub. Year	Application	Objectives	Methods	Limitation	Future Scope	ROC
1.	S. -Y. Chien et al.	2020	Automated level.	Increased openness to promote usage.	Mixed-model ANOVA.	Theoretical analysis.	Use some practical case studies.	7

2.	W. Liang et al.	2019	Wireless network automation.	Performance enhancement.	WIA-FA.	Less secure.	Upcoming wireless compatibility, privacy, and safety concerns will be resolved.	14
3.	M. L. Alvarez et al.	2018	Model-driven design automation.	Minimize architectural flaws and make testing processes simpler.	Model-driven engineering techniques, and PLC Open XML.	Less accurate.	Expansion of the platform with new M2M conversions.	5
4.	M. J. Iqbal et al.	2021	Home automation.	The accuracy rate for local scenarios was 88.71, for web events it was 88.55, and for app possibilities, it was 88.56.	Web and app-based automation.	Fails in emergencies.	Added for its effect on the Internet of Things (IoT).	3
5.	H. Lu et al.	2021	Cyber-physical–social systems.	Administration and supervision of transit improvements.	HetSS-TKA framework.	Less accuracy.	IoT integration.	4
6.	A. Canedo et al.	2021	Automation coding.	Suggest hardware that achieves 0.79 and 0.95.	Artificial intelligence, and machine learning.	Limited to hardware components.	High-level Artificial Intelligence.	1
7.	S. Ulewicz et al.	2018	Production Automation.	Regression testing process.	Change detection algorithms.	Runtime overhead is more.	There may be less runtime overhead.	4
8.	L. Pipkorn et al.	2022	Automation duration affects drivers.	Operators can securely disable automated after 4.5 to 14 minutes of automatic driving.	Driver response, driving performance, and take-over requests.	Less accuracy.	Allowing the drivers adequate time to prep properly.	3
9.	V. Graveto et al.	2023	Security purpose.	Out of 115101 possible outcomes, 113841 are predicted.	Network Intrusion Detection System.	Time-consuming.	High-level Artificial Intelligence.	1
10.	T. -Y. Lin et al.	2021	Pandemic-Transformed Catering Business.	Increasing corporate profitability by up to 95.4% in simulated scenarios for different cafeteria scales	Contactless meal order and takeout service automated system.	Small scale.	Large-scale implementation.	5
11	W. Dai et al.	2018	Fault protection.	To reduce downtime, anticipate system errors.	Fault trees analysis.	Lengthy approach.	The use of model-driven engineering techniques.	5
12	W. A. Jabbar et al.	2019	Smart Home.	Permit controlling home devices and analyzing house conditions in real-time.	Node microcontroller unit as a Wi-Fi-based gateway.	High risk of connection losses.	Instead of utilizing batteries, power the control box with solar panels.	22
13	J. Montalban et al.	2020	Industrial Automation.	Intends to provide two distinct types of services.	Non-Orthogonal Multiple Access.	Complex.	IoT and Artificial Intelligence.	6
14	B. Setz et al.	2021	Home automation.	Open-source home management programs are contrasted.	Home automation architecture.	Theoretical.	Practical.	4

15	I. ali et al.	2018	Microgrid.	Boost power quality, effectiveness, dependability, and security of supply.	Real-time system-in-the-loop simulation.	Small scale.	Large-scale implementation.	9
16	Chrispin Gray et al.	2020	Home automation.	HES increase of over one-third of per year household spending.	A bottom-up approach to developing novel system-level energy consumption models.	Less accuracy.	IoT integration.	8
17	H. Dibowski et al.	2018	Industrial Automation.	Examines the advancements in device and system modeling at the moment.	Device information model.	Costly.	Concept of Software Defined Systems.	3
18	Y. Qamsane et al.	2022	Industry 4.0.	Utilizing a methodology, producers can create, test, and assess technological advances.	Open Process Automation and Digital Twin (DT) technologies.	Temperature and pressure parameters are missing.	Develop more DT capabilities to realize a system-wide DT framework.	15
19	L. Lo Bello et al.	2019	Industry communication.	Practical areas and industrial automation were discussed in detail.	IEEE 802.1 Time-Sensitive Networking.	Less accuracy.	IoT and Artificial Intelligence.	36
20	C. W. Yang et al.	2020	Smart grid.	Create a framework and command flow for an IEC 61499 PAC management system automatically.	Smart grid MDE framework.	Presently, the NL form is manually converted to the BP form.	SOA-based design pattern.	4
21	A. H. Sodhro et al.	2021	IoT-Enabled Smart Automation Systems.	Correlation between subjective test results and quantitative quality measures and handheld device portability.	QoS-based joint energy and entropy optimization (QJEEO) algorithm.	Less feasible.	The use of peripheral smart 6G networks for harvested energy in industrial uses will be investigated.	25
22	J. E. Domeyer et al.	2020	Autonomous Vehicles.	Think about possible signals as well as how the vehicle communicates.	Survey.	Not updated.	Update it till 2023.	9
23	Z. Salcic et al.	2019	ROS-enabled Baxter robots.	Enables program behavior to be dynamically composed.	SOSJ is based on the system-level programming language.	Fault tolerance is less supported.	Expand the quantitative scope of our assessment of SOSJ with other platforms like JADE and ROS.	4
24	I. S. Choi et al.	2020	Cybersecurity.	A plan for detecting and thwarting a cyberattack on the distribution network.	Cybersecurity enhanced distribution automation system.	Less accuracy.	Artificial Intelligence (AI) and Machine Learning (ML) based solutions.	3
25	X. Wang et al.	2022	Substation automation systems.	FNR is decreased from 30.261 percent to 0.372 percent, which increases detection accuracy.	Bidirectional Long Short-Term Memory Network.	Low-level station bus.	Secure both SV connectivity and high-level station bus interaction.	4
26	G. Quiros et al.	2020	IoT.	Organize the network's computing tasks while ensuring real-time performance.	Distributed computing, and dynamic compiler.	Less accuracy.	A decentralized automation strategy utilizing PLC and intelligent sensors.	2

27	J. E. Domeyer et al.	2020	Autonomous vehicles.	Evaluate the two communication protocols as the automation of vehicles develops.	Survey.	Theoretical analysis.	Understanding by experimentation.	9
28	Z. Wang et al.	2021	Driver automation.	HG-adaptive Decrease's authority will enhance driver and automated cooperation.	Haptic guidance.	The sample group was biased toward young male drivers.	Operator grip strength and systems command adjust to each other.	2
29	N. N. W. Tay et al.	2018	Smart homes.	The system may produce sophisticated strategies based on the actions produced by semantic tagging.	Weighted constraint satisfaction problem.	Less accuracy.	IoT and Artificial Intelligence.	1
30	M. Ding et al.	2018	IoT.	Minimizing design time and having accurate control.	Analog to digital converters using successive approximation in asynchronous mode.	Complex.	Artificial Intelligence.	4

3. MARKET SCENARIO OF AUTOMATION TECHNOLOGY

The anticipated share of the global factory automation business in 2021 was USD 196.6 billion, and projections indicate that it will reach USD 412.8 billion by 2030, growing at a CAGR of 8.59 percent from 2022 to 2030 [31].

Automated machines, human interfacing (HMI), business sensors, control devices, and other elements are the primary elements of factory automation. HMIs are used in Industry 4.0 to keep an eye on equipment to make sure it is functioning properly. They are also useful for keeping industrial equipment maintained. They employ a variety of control systems, including those used by aerospace and defense, automobiles, universal health care, power and utility services, production, oil and gas, mineral extraction, mass transit, and other companies. These systems include decentralized control systems (DCS), programmable logic controllers (PLC), manufacturing resource planning (MES), constituent lifecycle management (PLM), enterprise systems (ERP), and human-machine interfaces (HMI). Sensors, controllers, robotics, drivers, and other components make up the largest hardware category.

ABB LTD, Emerson, Fanuc, Honeywell, Mitsubishi, Omron, Robert Bosch, Rockwell Automation, and Siemens AG are the largest companies in the automation field.

The countries with the fastest growth in this industry include Mexico, the United Kingdom, India, the United Arab Emirates, and Brazil.

The region with the quickest growth rate and the largest market share in Asia Pacific.

3.1. Key Market Challenges

- **Price hikes -** The business expansion of factory automation over the projected timeframe may be hampered by the rising deployment of factory automation together with increasing system costs.
- Inadequate knowledge of newly invented technology in factory automation. The task involves in-depth expertise and more comprehensive data leading to enhanced innovations in tools, equipment, and software systems. Lack of training could impede the market's expansion for Industry 4.0.
- The absence of standards for interacting with equipment, techniques, and systems built into them, as well as an absence of operating procedures Lack of protocols, administration with added complexity, and use of one's way could impede market expansion during the projection time. Failure to communicate with other devices is the effect of this.

3.2. Key Market Opportunities

- Industry 4.0 uses a variety of techniques to create technologies that, should an error occur during product creation, could be dangerous to people. To prevent such mishaps, the safety controls in factory automation are strengthened, which lowers the crash rate.
- Improved solutions for machine and system failures and early diagnosis of issues with machines during the production process. For machinery that meets quality and safety standards, the government introduced increased safety precautions. International Electrotechnical Commission and International Standard Organization safety requirements.
- The finished product will improve with improved machine and human security. During the anticipated period, strong output and performance improvement in factory automation contribute to the market's development.

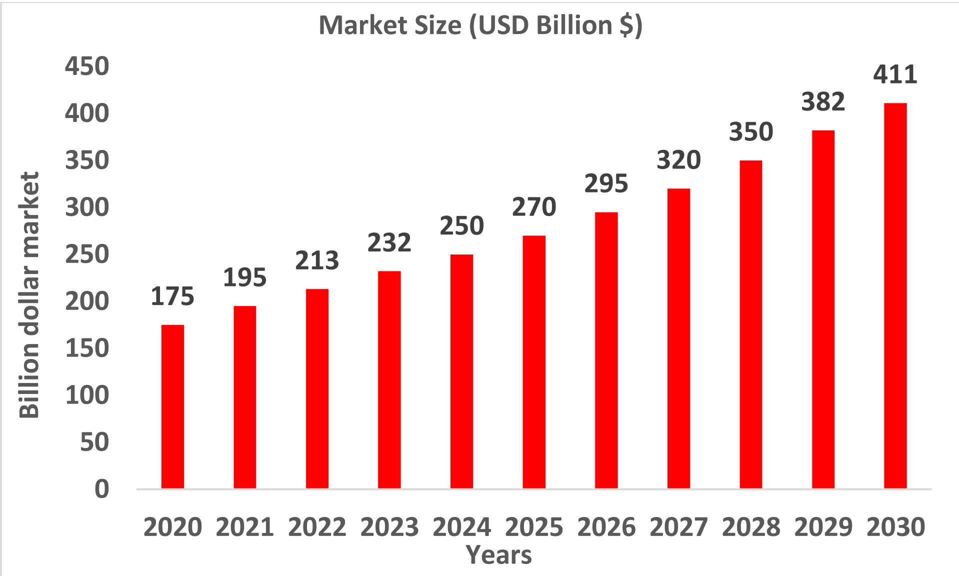

Fig. 1: Global market size prediction of the automation industry from 2020 to 2030

4. CONCLUSION AND FUTURE SCOPE

The rapid increase in the production of data is making synthesis for evidence-based medicine increasingly impractical. To improve the process, limited resources can be used more effectively with computational support and automation. With the help of the insights learned from systems and software engineering, health informaticians are particularly qualified to lead the effort to change evidence-based medicine. With automated processes and computational support, the limited resources allocated to evidence synthesis can be used more effectively. On-site, the robot's technology, and technique have been heavily deployed with a focus on low-rise buildings. More evaluations will be produced to address more clinical concerns, maintain them current, and demand less training if reviews are conducted more quickly and with scarce assets. Together, improvements in comprehensive literature automation will give clinicians access to more evidence-based information, enabling them to deliver higher-quality care. According to available data, not all of the review process's processes have yet been automated. The majority of the Performing Review phases of the systematic literature review conducted are the emphasis. Scientific investigations, however, have not focused on all of the processes. Depending on the nature of the core problem, some processes are technically more difficult to automate than others, while other steps demand technical difficulties. For some of these issues, information and software technology is insufficient, necessitating the use of additional methods and tools. Additionally, there is a lack of tool support. The literature review procedure benefits from automation because it drastically cuts down on the time and effort needed; this automation goal will become increasingly important in the future in many different sectors. In terms of future research, we intend to create a deep learning tool to automate the critical appraisal process selection of primary studies. Other incorporating technologies, such as alternative energy sources, electric vehicles, etc., lead to automated technology. To improve system performance generally, artificial intelligence, artificial neural networks, recent optimization methods, etc., are integrated.

REFERENCES

[1]. S. Y. Chien, M. Lewis, K. Sycara, A. Kumru, & J. -S. Liu, (2020) "Influence of Culture, Transparency, Trust, and Degree of Automation on Automation Use," *in IEEE Transactions on Human-Machine Systems*, Vol. 50, No. 3, pp. 205-214, DOI: 10.1109/THMS.2019.2931755.

[2]. Liang, W., Zheng, M., Zhang, J., Shi, H., Yu, H., Yang, & Y. Zhao, (2019) "WIA-FA & Its Applications to Digital Factory: A Wireless Network Solution for Factory Automation", *Proceedings of the IEEE, 1–21.* DOI:10.1109/jproc.2019.2897627

[3]. M. L. Alvarez, I. Sarachaga, A. Burgos, E. Estévez & M. Marcos, (2018) "A Methodological Approach to Model-Driven Design & Development of Automation Systems," *in IEEE Transactions on Automation Science and Engineering*, Vol. 15, No. 1, pp. 67-79, DOI: 10.1109/TASE.2016.2574644.

[4]. M. J. Iqbal et al., (2021) "Smart Home Automation Using Intelligent Electricity Dispatch," *in IEEE Access*, Vol. 9, pp. 118077-118086, DOI: 10.1109/ACCESS.2021.3106541.

[5]. H. Lu et al., (2021) "Social Signal-Driven Knowledge Automation: A Focus on Social Transportation," *in IEEE Transactions on Computational Social Systems*, Vol. 8, No. 3, pp. 737-753, DOI: 10.1109/TCSS.2021.3057332.

[6]. A. Canedo, P. Goyal, D. Huang, A. Pandey, & G. Quiros, (2021) "ArduCode: Predictive Framework for Automation Engineering," *in IEEE Transactions on Automation Science and Engineering*, Vol. 18, No. 3, pp. 1417-1428, DOI: 10.1109/TASE.2020.3008055.

[7]. S. Ulewicz & B. Vogel-Heuser, (2018) "Industrially Applicable System Regression Test Prioritization in Production Automation," *in IEEE Transactions on Automation Science and Engineering*, Vol. 15, No. 4, pp. 1839-1851, DOI: 10.1109/TASE.2018.2810280.

[8]. L. Pipkorn, T. Victor, M. Dozza & E. Tivesten, (2022) "Automation Aftereffects: The Influence of Automation Duration, Test Track, and Timings," *in IEEE Transactions on Intelligent Transportation Systems*, vol. 23, no. 5, pp. 4746-4757, May, DOI: 10.1109/TITS.2020.3048355.

[9]. V. Graveto, T. Cruz & P. Simoes, (2023) "A Network Intrusion Detection System for Building Automation and Control Systems," in IEEE Access, vol. 11, pp. 7968-7983, 2023, DOI: 10.1109/ACCESS.2023.3238874.

[10]. T. Y. Lin, K. R. Wu, Y. S. Chen, W. H. Huang & Y. -T. Chen, (2021) "Takeout Service Automation With Trained Robots in the Pandemic-Transformed Catering Business," *in IEEE Robotics and Automation Letters*, Vol. 6, No. 2, pp. 903-910, DOI: 10.1109/LRA.2021.3052451.

[11]. W. Dai, L. Riliskis, P. Wang, V. Vyatkin & X. Guan, (2018) "A Cloud-Based Decision Support System for Self-Healing in Distributed Automation Systems Using Fault Tree Analysis," *in IEEE Transactions on Industrial Informatics*, Vol. 14, No. 3, pp. 989-1000, DOI: 10.1109/TII.2018.2791503.

[12]. W. A. Jabbar et al., (2019) "Design and Fabrication of Smart Home With the Internet of Things Enabled Automation System," *in IEEE Access*, Vol. 7, pp. 144059-144074, DOI: 10.1109/ACCESS.2019.2942846.

[13]. J. Montalban, E. Iradier, P. Angueira, O. Seijo & I. Val, (2020) "NOMA-Based 802.11n for Industrial Automation," *in IEEE Access*, Vol. 8, pp. 168546-168557, DOI: 10.1109/ACCESS.2020.3023275.

[14]. B. Setz, S. Graef, D. Ivanova, A. Tiessen & M. Aiello, (2021) "A Comparison of Open-Source Home Automation Systems," Vol. 9, pp. 167332-167352, DOI: 10.1109/ACCESS.2021.3136025.

[15]. I. Ali & S. M. Suhail Hussain, (2018) "Communication Design for Energy Management Automation in Microgrid," *in IEEE Transactions on Smart Grid*, Vol. 9, No. 3, pp. 2055-2064, DOI: 10.1109/TSG.2016.2606131.

[16]. C. Gray, R. Ayre, K. Hinton, & L. Campbell, "'Smart' Is Not Free: Energy Consumption of Consumer Home Automation Systems," *in IEEE Transactions on Consumer Electronics*, Vol. 66, No. 1, pp. 87-95, DOI: 10.1109/TCE.2019.2962605.

[17]. H. Dibowski, J. Ploennigs, & M. Wollschlaeger, (2018) "Semantic Device and System Modeling for Automation Systems and Sensor Networks," *in IEEE Transactions on Industrial Informatics*, Vol. 14, No. 4, pp. 1298-1311, DOI: 10.1109/TII.2018.2796861.

[18]. Y. Qamsane, J. R. Phillips, C. Savaglio, D. Warner, S. C. James, & K. Barton, (2022) "Open Process Automation- and Digital Twin-Based Performance Monitoring of a Process Manufacturing System," *in IEEE Access*, Vol. 10, pp. 60823-60835, DOI: 10.1109/ACCESS.2022.3179982.

[19]. L. Lo Bello & W. Steiner, (2019) "A Perspective on IEEE Time-Sensitive Networking for Industrial Communication and Automation Systems," *in Proceedings of the IEEE*, Vol. 107, No. 6, pp. 1094-1120, DOI: 10.1109/JPROC.2019.2905334.

[20]. C. W. Yang, V. Dubinin & V. Vyatkin, (2020) "Automatic Generation of Control Flow From Requirements for Distributed Smart Grid Automation Control," *in IEEE Transactions on Industrial Informatics*, Vol. 16, No. 1, pp. 403-413, DOI: 10.1109/TII.2019.2930772.

[21]. A. H. Sodhro, S. Pirbhulal, Z. Luo, K. Muhammad, & N. Z. Zahid, (2021) "Toward 6G Architecture for Energy-Efficient Communication in IoT-Enabled Smart Automation Systems," *in IEEE Internet of Things Journal*, Vol. 8, No. 7, pp. 5141-5148, DOI: 10.1109/JIOT.2020.3024715.

[22]. J. E. Domeyer, J. D. Lee, & H. Toyoda, (2020) "Vehicle Automation–Other Road User Communication and Coordination: Theory and Mechanisms," *in IEEE Access*, Vol. 8, pp. 19860-19872, DOI: 10.1109/ACCESS.2020.2969233.

[23]. Z. Salcic, U. D. Atmojo, H. Park, A. T. Y. Chen, & K. I. K. Wang, (2019) "Designing Dynamic and Collaborative Automation and Robotics Software Systems," *in IEEE Transactions on Industrial Informatics*, Vol. 15, No. 1, pp. 540-549, DOI: 10.1109/TII.2017.2786280.

[24]. I. S. Choi, J. Hong, & T. W. Kim, (2020) "Multi-Agent-Based Cyber Attack Detection and Mitigation for Distribution Automation System," *in IEEE Access*, Vol. 8, pp. 183495-183504, DOI: 10.1109/ACCESS.2020.3029765.

[25]. X. Wang, C. Fidge, G. Nourbakhsh, E. Foo, Z. Jadidi & C. Li, (2022) "Anomaly Detection for Insider Attacks from Untrusted Intelligent Electronic Devices in Substation Automation Systems," in IEEE Access, Vol. 10, pp. 6629-6649, DOI: 10.1109/ACCESS.2022.3142022.

[26]. G. Quiros, D. Cao, & A. Canedo, (2020) "Dispersed Automation for Industrial Internet of Things," *in IEEE Transactions on Automation Science and Engineering*, Vol. 17, No. 3, pp. 1176-1181, DOI: 10.1109/TASE.2020.2978527.

[27]. J. E. Domeyer, J. D. Lee & H. Toyoda, (2020) "Vehicle Automation–Other Road User Communication and Coordination: Theory and Mechanisms," *in IEEE Access*, Vol. 8, pp. 19860-19872, DOI: 10.1109/ACCESS.2020.2969233.

[28]. Z. Wang, S. Suga, E. J. C. Nacpil, Z. Yan & K. Nakano, (2021) "Adaptive Driver-Automation Shared Steering Control via Forearm Surface Electromyography Measurement," *in IEEE Sensors Journal*, Vol. 21, No. 4, pp. 5444-5453, DOI: 10.1109/JSEN.2020.3035169.

[29]. N. N. W. Tay, J. Botzheim & N. Kubota, (2018) "Human-Centric Automation and Optimization for Smart Homes," *in IEEE Transactions on Automation Science and Engineering*, Vol. 15, No. 4, pp. 1759-1771, DOI: 10.1109/TASE.2018.2789658.’’

[30]. M. Ding et al., (2018) "A Hybrid Design Automation Tool for SAR ADCs in IoT," *in IEEE Transactions on Very Large-Scale Integration (VLSI) Systems*, Vol. 26, No. 12, pp. 2853-2862, DOI: 10.1109/TVLSI.2018.2865404.

[31]. Precedence Research, (2022) “Semiconductor and Electronic”, *Industrial Automation Market*, DOI: https://www.precedenceresearch.com/industrial-automation-market

[32]. Tsafnat, Guy & Glasziou, Paul & Choong, Miew Keen & Dunn, Adam & Galgani, Filippo & Coiera, Enrico. (2014). “Systematic review automation technologies”, *Systematic reviews*. DOI: 3. 74. 10.1186/2046-4053-3-74.

[33]. Shubham Singh Swapnil Namekar, (2020) “A Review on Automation of Industries”, *International Journal of Engineering Applied Sciences and Technology*, Vol. 4, No. 12, ISSN No. 2455-2143, pp. 298-300.

AUTHORS

Pankaj Kumar Dubey received a B. Tech degree in electrical and electronics engineering from Babu Bhola Singh College of Engineering and Technology, Prayagraj, U.P, India, in 2019, and an M. Tech. in electrical engineering (power systems) from Kamla Nehru Institute of Technology, Sultanpur, U.P. in 2022. Currently, he is pursuing a Ph. D. in electrical engineering (Power Electronics & Drives) from the Kamla Nehru Institute of Technology, Sultanpur, U.P. He will be available at pankajdubeysangamboy@gmail.com.

Bindeshwar Singh received a B.E. degree in electrical engineering from Madan Mohan Malviya Engineering College, Gorakhpur, U.P., India, in 1999, and an M. Tech. in electrical engineering (power systems) from the Indian Institute of Technology, Roorkee, Uttaranchal, India, in 2001. He received a Ph. D. degree in electrical engineering (power system) from the Indian Institute of Technology (Indian School of Mines), Dhanbad, Jharkhand, India, in 2017. Presently, he is an assistant professor (Stage-III) in the department of electrical engineering, Kamla Nehru Institute of Technology, Sultanpur 228118, U.P India, where he has been since August 2009. His areas of research interest are optimal placement, sizing, and properly coordinated control of DG and FACTS controllers in power systems. He will be available at bindeshwar.singh2025@gmail.com.

Deependra Singh received the B.Tech. degree in electrical engineering from Harcourt Butler Technological Institute, Kanpur, India, in 1997 and the M.E. degree in electrical engineering from the University of Roorkee, Roorkee, India, in 1999. He received a Ph.D. degree from UP Technical University, Lucknow, India 2009; Currently, he is the Head of the Department in Electrical Engineering, at Kamla Nehru Institute of Technology, Sultanpur (UP), India; His research interests are distributed generation planning and distribution system analysis. He will be available at deependra_knit@yahoo.com.