Guest Editorial Preface

Advanced Multi-Criteria Decision-Making Approaches Application Towards Sustainable Development of Industry 4.0 Sectors

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The compilation and integration of digital technological architectures under traditional production system have evolved the concept of Industry 4.0 (Asongu and Roux, 2017; Luthra and Mangla, 2018). In present era, industry 4.0's production systems have built the industrial sectors more dynamic and robust to effectually address the future marketplace competition and defies (Thoben et al., 2017; Brettel et al., 2014). The digital technological architectures add the production system greater efficiencies and build the great relationships among vendors, manufacturers, and customers as well (Luthra and Mangla, 2018; Hofmann and Rüsch, 2017) Digitization and implicating smart manufacturing tactics are the need for today's industry. Industry 4.0 defined a new level of organization and stresses on implicating control mechanism over to the entire value chain of manufacturing stuffs (Gröger, 2018; Bibby and Dehe, 2018). Multi Criteria Decision Making (MCDM) is an advanced field of operations research (Sahu et al., 2017; Wanga et al., 2019), which assist the Industry 4.0 sectors from several perspectives such as assessing sustainability of modern vendors, assessment of equipments utility, evaluation of parts manufacturing firm's status and others (Malviya and Kant, 2017; Khan and Maity, 2017). MCDM can effectively find elevated results under complex scenarios by comprising diverse indicators, conflicting objectives and criteria (Mi et al., 2017; Tupenaite et al., 2010). The same assists in structuring complex problems considering multiple criteria's and leads to determining better decisions (Sahu et al., 2020a; Sahu et al., 2020b). MCDM methods robustly enrol effectual means for contrasting resulting rankings (Macharis and Bernardini, 2015; Barfod et al., 2011). MCDM methods in decision making best synchronizes influential parameters (Guhnemann et al., 2012; Jessop, 2014), and can be used to evaluate economic and environmental indicators (Sahu et al., 2018; Sahu et al., 2014).

The special issue embrace its existence by logging towards various means, analytical tools, framework for optimally allocating and advancing dimensional arena of Industry 4.0 and related elements. This special issue provides notable insight towards better understanding of business ecosystem under the aegis of Industry 4.0 through numerous means and modes. The main intension of the special issue is to implicate the conceptual arena of intelligent MCDM techniques towards the Industry 4.0 sectors, logging towards smart supply smart networking, automating smart manufacturing

and monitoring provisions, data analyzing and machine learning, cloud computing, networking areas to focus on sustainable industry 4.0 architectures, developing supply chain models, frameworks, techniques, ideas, novel concepts etc., to approach towards industry 4.0 development, tracing of current research trends and growth of industry 4.0 supply chain etc. The objective of present special issue 'Advanced Multi-Criteria Decision-Making Approaches Application Towards Sustainable Development of Industry 4.0 Sectors' is to archive research contribution and documents, which could enable the Industry 4.0 sectors more sustainable in future. The special issue stimulated the current scholars/researchers to contribute their research articles for peer review process.

HIGHLIGHTS

The present special issue swung with imaginative, inventive, creative research documents-portfolios. The simulated issue gained the high momentum and procured overwhelming research papers with good sound and agility from researchers, scholars, academicians and practitioners. The special issue (call for paper) "Advanced Multi-Criteria Decision-Making Approaches Application Towards Sustainable Development of Industry 4.0 Sectors" successfully archived and recorded significance, imaginative, inventive and creative research documents under the portfolio of International Journal of Social Ecology and Sustainable Development. The special issue can assists research production teams, researchers, scholars, academicians to pro-explore, revive, refresh, quench, and optimize their research reminiscence, and brain for obtaining successful business and academies entities via handling the future industry 4.0 defies.

The papers had been evaluated and benchmarked by exploring the online guest editor portal and submission constrained, guidelines and policy of IGI, Global. Due to the high pickup and acceleration of said special issue, 5 papers are respected after vigorous reviews and revisions, appended under volume 12 with issue 2 to be associated with the library of IJSESD, IGI, Global, USA. The published articles over issues will enforce the future researchers and actuate them to crack and pop the industry 4.0 dilemmas of industries.

The Summary of Vol.12, Issue No. 2

In the first paper, the authors; Debasis Tripathy, Nalin Behari Dev Choudhury and Binod Kumar Sahu have proposed that automatic generation control (AGC) enrolls an automation scheme that regulates the output of several generators employed at different areas of an interconnected power system simultaneously in response to load variation in the most economical way. The work have implemented a Fuzzy-Two Degree of Freedom-PID controller considering derivative filter (F-2D-PIDF), which optimally tuned through Grasshopper optimization algorithms (GOA) for AGC of a three unequal area interconnected power system. Comparative performance analysis is carried out by particle swarm optimization, teaching learning based optimization and GOA techniques. Comparative performance analysis reveals that GOA based F-2D-PIDF controller outperforms other controllers in all aspects.

In the second paper, the authors; Smita Rath, Binod Kumar Sahu and Manoj Ranjan Nayak presented a robust, effective metaheuristic technique called Symbiotic Organisms Search (SOS) algorithm which is incorporated with Extreme Learning Machines (ELM) model to enhance the forecasting performance. The metaheuristic techniques such as SOS, Teaching Learning Based Optimization (TLBO), Differential Evolution (DE) and Particle Swarm Optimization (PSO) are implemented to optimally design the weights and biases of EML models. The work have engrossed several statistical measures such as MSE (Mean Square Error), MAPE (mean absolute percentage error), and accuracy as performance measures.

In the third paper, the authors; Puneet Kumar, Amalanathan Paul and M. Anil Kumar, assisted "Sai Builders" in solving their Portfolio Investment problem as well as Sinking Funds problem using Linear Programming and to obtain the total optimum returns by satisfying all constraints. The problem of minimizing portfolio risk measures is encountered by the authors. The expected return of the portfolio

is maximized and the impact of these risk measures on portfolio optimization is illustrated in said work. The work embraced in the direction of achieving optimum solution under many constraints.

In the fourth paper, the authors; Veluru Lakshmi Pavani and D. Pradeep Kumar articulated that industry 4.0 is significant in securing information discovery. The work disclosed that in most existing information discovery systems, mobile computing process is complex due to its continuous query processing overhead to provide "right information at right time". The work provided a process and industry 4.0 architectures measures to performs a secure information and discovery database through securing the users query. The work enrolls its significant by securing the information discovery using mobile agents in wireless industry 4.0 networks.

The next paper is pertaining to the author; Dr. Sri Yogi Kottala, who disclosed that implementing the concept of social sustainability in supply chain business activities is must for synchronizing legislations as well corporate social responsibility by the industries in emerging economies. His work accordingly investigated key factors influencing the adoption of social sustainability in supply chain activities of Indian manufacturing sector as a social development perspective. The study have covered literature review on sustainable supply chain covering social perspectives as well chosen Indian manufacturing companies to investigate social perspectives. The work has proposed the concept of "house of social sustainable supply chain management practices" for Indian manufacturing sector.

REFERENCES

Asongu, S. A., & Roux, S. L. (2017). Enhancing ICT for inclusive human development in Sub-Saharan Africa. *Technological Forecasting and Social Change*, *118*, 44–54. doi:10.1016/j.techfore.2017.01.026

Barfod, M. B., Salling, K. B., & Leleur, S. (2011). Composite decision support by combining cost-benefit and multi-criteria decision analysis. *Decision Support Systems*, *51*(1), 167–175. doi:10.1016/j.dss.2010.12.005

Bibby, L., & Dehe, B. (2018). Defining and assessing industry 4.0 maturity levels – case of the defence sector. *Production Planning and Control*, *29*(12), 1030–1043. doi:10.1080/09537287.2018.1503355

Brettel, M., Friederichsen, N., & Keller, M. (2014). How Virtualization, Decentralization and Network Building Change the Manufacturing Landscape: An Industry 4.0 Perspective. International Journal of Mechanical, Aerospace, Industrial. *Mechatronic and Manufacturing Engineering.*, *8*(1), 37–36.

Gröger, C. (2018). *Building an Industry 4.0 Analytics Platform. Practical Challenges, Approaches and Future Research Directions. In Daten bank- Spektrum 2018*. Springer.

Guhnemann, A., Laird, J. L., & Pearman, A. D. (2012). Combining cost-benefit and multi-criteria analysis to prioritise a national road infrastructure programme. *Transport Policy*, *23*, 15–24. doi:10.1016/j.tranpol.2012.05.005

Hofmann, E., & Rüsch, M. (2017). Industry 4.0 and the current status as well as future prospects on logistics. *Computers in Industry*, *89*, 23–34. doi:10.1016/j.compind.2017.04.002

Jessop, A. (2014). IMP: A decision aid for multiattribute evaluation using imprecise weight estimates. *Omega*, *49*, 18–29. doi:10.1016/j.omega.2014.05.001

Khan, A., & Maity, K. (2017). Application of MCDM-based TOPSIS method for the selection of optimal process parameter in turning of pure titanium. *Benchmarking*, *24*(7), 2009–2021. doi:10.1108/BIJ-01-2016-0004

Luthra, S., & Mangla, S. K. (2018). Evaluating challenges to Industry 4.0 initiatives for supply chain sustainability in emerging economies. *Process Safety and Environmental Protection*, *117*, 168–179. doi:10.1016/j.psep.2018.04.018

Macharis, C., & Bernardini, A. (2015). Reviewing the use of Multi-Criteria Decision Analysis for the evaluation of transport projects: Time for a multi-actor approach. *Transport Policy*, *37*, 177–186. doi:10.1016/j.tranpol.2014.11.002

Malviya, R. K., & Kant, R. (2017). Modeling the enablers of green supply chain management: An integrated ISM – fuzzy MICMAC approach. *Benchmarking*, *24*(2), 536–568. doi:10.1108/BIJ-08-2015-0082

Mi, C., Xiao, L., Sifeng, L., & Xiaoyan, R. (2017). A multiple-attribute decision-making method based on the mean value of grey number weight optimisation and its application in supply-chain management. Grey Systems. *Theory and Application.*, *7*(2), 297–307. doi:10.1108/GS-09-2016-0026

Sahu, A. K., Sahu, N. K., & Sahu, A. K. (2014). Appraisal of CNC machine tool by integrated multi MOORA-IGVN circumstances: An empirical study. *International Journal of Grey Systems: Theory and Application.*, *4*(1), 104–123.

Sahu, A. K., Sahu, N. K., & Sahu, A. K. (2017). Appraisements of material handling system in context of fiscal and environment extent: A comparative grey statistical analysis. *International Journal of Logistics Management*, *28*(1), 1–30. doi:10.1108/IJLM-09-2015-0163

Sahu, A. K., Sahu, N. K., & Sahu, A. K. (2020a). A Review on the Research Growth of Industry 4.0: IIoT Business Architectures Benchmarking. *International Journal of Business Analytics*, *7*(1), 77–97. doi:10.4018/IJBAN.2020010105

Sahu, A. K., Sahu, N. K., Sahu, A. K., Rajput, M. S., & Narang, H. K. (2020b). An Investigation Tool for Mounting Sustainable Practice: Modeling Using GIVTFNs in an Indian Context. *International Journal of Decision Support System Technology*, *12*(20), 25–49. doi:10.4018/IJDSST.2020040102

Sahu, N. K., Sahu, A. K., & Sahu, A. K. (2018). Cluster Approach Integrating Weighted Geometric Aggregation Operator to Appraise Industrial Robot: Knowledge Based Decision Support System. *Kybernetes*, *47*(3), 487–524. doi:10.1108/K-11-2016-0332

Thoben, K. D., Wiesner, S., & Wuest, T. (2017). Industrie 4.0 and Smart Manufacturing- A Review of Research Issues and Application Examples. *International Journal of Automotive Technology*, *11*(1), 4–16.

Tupenaite, L., Zavadskas, E. K., Kaklauskas, A., Turskis, Z., & Seniut, M. (2010). Multiple criteria assessment of alternatives for built and human environment renovation. *Journal of Civil Engineering and Management*, *16*(2), 257–266. doi:10.3846/jcem.2010.30

Wanga, W., Huang, L., Jiang, L., Jiang, L., Sahu, A. K., Sahu, N. K., & Sahu, A. K. (2019). Decision support system towards evaluation of resilient supplier: A novel fuzzy gain- loss computational approach. *Kybernetes*, *47*(6), 1090–1121. doi:10.1108/K-05-2019-0345