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## Editorial

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**Biographical notes:** Manoj Kumar Tiwari is an Associate Professor in the Department of Industrial Engineering and Management, IIT Kharagpur, India. He has 17 years of teaching and research experience at different levels. He works in the area of evolutionary computing, applications, modelling and simulation of manufacturing system, supply chain management, planning and scheduling of automated manufacturing system, etc. He was Visiting Professor in the Department of Industrial and System Engineering, University of Wisconsin, Madison. He has published around 120 papers in leading international journals and is serving as Editorial Board Member of seven international journals. He is Associate Editor of *Journal of Intelligent Manufacturing and International Journal of System Science*. He is well known for grooming undergraduate students and motivating them to pursue careers through research route.

Ravi Shankar is Group Chair of Sectoral Management and Associate Professor of Operations and Information Technology Management at the Department of Management Studies at Indian Institute of Technology Delhi, India. He has nearly 23 years of teaching and research experience. His areas of interest are supply chain management, knowledge management, flexible manufacturing systems, quantitative modeling, etc. He has over 100 publications in journals and conference proceedings. His publications have appeared in various journals including the *European Journal of Operational Research*, *International Journal of Production Research*, *Computers and Industrial Engineering*, *International Journal of Production Economics*, *Computers and Operations Research*, *International Journal of Supply Chain Management*, etc. He is the Executive Editor of *Journal of Advances in Management Research*.

Felix Chan received a BSc in Mechanical Engineering from Brighton Polytechnic (now University), UK, and received a PhD in Manufacturing Engineering from the Imperial College of Science and Technology, University of London, UK. He is now an Associate Professor at the Department of Industrial and Manufacturing Systems Engineering, The University of Hong Kong. His current research interests are logistics and supply chain management, distribution coordination, systems modelling and simulation, supplier selection. To date, he has published seven book chapters, over 150 refereed international journal papers and 180 peer reviewed international conference papers. He is a Chartered Member of the Chartered Institute of Logistics and Transport in Hong Kong.

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## 1 Introduction

We dedicate this Special Issue to modelling and solving emerging problems encountered in Design, Manufacturing, Logistics and Supply Chains utilising prevalent AI and Simulation tools. Such problems have constantly been challenging the existing industrial scenario and developing efficient solutions strategies for them require a keen attention to be paid. Although a lot of research has already been done in order to resolve the complexities encountered, yet the need to have rigorous research insights still persists as ever. In general, we visualise two basic approaches to tackle the problem at hand – Operations Research (OR) and Artificial Intelligence (AI) techniques; while a third emerging classification is of Simulation-based Approaches. Of these, OR techniques have been the most preliminary and in use since long. Their representation is through mathematical modelling languages and linear/non-linear constraints, whereas, they are usually approached by Linear Programming, Mixed Integer Programming, etc. However, such techniques are characterised by computational complexity and their modelling is a good mind boggling exercise though. Thus, the natural instinct is to rely upon AI-based heuristic/metaheuristic methods and other simulation tools, particularly in the cases where simply obtaining a near optimal solution, in shortest possible time, is needed.

We have invited people from academia and industry to submit papers on their recent research experience in the application of evolutionary computation to the fields of design, manufacturing, logistics and supply chain. We received overwhelming response worldwide. After a rigorous review, 10 papers have been accepted for publication in this issue. Each of the accepted papers employs evolutionary approaches to manufacturing, design, logistics and supply chain problems. In fact, submissions were mainly about either a novel approach applied to a well-known problem or an established method exploited for solving the real manufacturing, design, logistics and supply chain problems.

The first paper by R. Zhou, H.P. Lee and A.Y.C. Nee simulated the generic job shop as a Multi-Agent System. Moreover, a test bed comprising of Discrete Event System and Multi-Agent System has been devised to systematically study the performance of control rules and algorithms in dynamic job shop scheduling. The proposed model is validated with a case study through statistical analysis and comparison with work present in literature. In the second paper, R. Maheswaran, S.G. Ponnambalam and N. Jawahar emphasises on an NP hard single machine scheduling problem with an objective to

minimise the total tardiness of the system. They have introduced a couple of hybrid heuristic and implemented them on 125 benchmark datasets to prove the superiority of hybrid algorithm with evolutionary perturbation.

The paper titled 'Mining manufacturing data using genetic algorithm-based feature set decomposition', by L. Rokach introduces a genetic decomposition approach in order to emphasise over mining quality-related data in manufacturing. The decomposition methodology is used to break down a complex problem into several manageable fragments such that each expert aims to solve a task with an exclusive data set. Further, authors have tested the algorithm on real life data set and consequentially established superiority of the proposed algorithm. The fourth paper by Y. Kovvur, H. Ramaswami, R.B. Anand and S. Anand proposes to evaluate the various minimum-zone form tolerances using an evolutionary Particle Swarm Optimisation. In order to establish its superiority over other existing minimum-zone algorithms, a testbed comprising of several benchmark data was utilised and the computational comparisons were performed.

In the subsequent paper 'A modified tabu search strategy for multiple-response grinding process optimisation', I. Mukherjee and P.K. Ray present a modified tabu search for optimising the inherent parameters of multiple responses grinding process. It is further integrated with the Artificial Neural Network to determine optimal/near optimal conditions for a finish grinding process. Computational results demonstrate the consistency of proposed methodology in terms of sample mean and standard deviation of composite desirability measures, as compared to real-coded genetic algorithm. The next paper by Y. Cohen, E. Dar-El, G. Vitner and S. Sarin addresses the problem of allocating work to the stations of an assembly line for minimising the makespan that was required to process a lot of products with a low overall demand. The next paper by C. Qi and H.X. Li, focuses on developing a low-order model for a class of quasi-linear parabolic distributed parameter system with unknown linear spatial operator, unknown linear boundary condition and unknown non-linearity. Its efficiency and effectiveness have been proved by performing simulation on a control rod case study taken into consideration.

In the paper titled 'Techno-economic analysis of hybrid layered manufacturing', K.P. Karunakaran, V. Pushpa, S.B. Akula and S. Suryakumar consider hybrid-layered manufacturing that comprises the best features of Subtractive and Additive manufacturing. Finally, its techno-economic viability has been proved through a real life simulation study. In their paper, L. Zhang, Y. Rong, H.F. Shen and T.Y. Huang illustrate the application of Finite point method on modelling of a metal solidification process of continuous casting. The model is verified on standard problems and then employed to simulate the solid shell growth of continuous casting large square blank in mould. In the next paper, 'Optimal layout and work allocation in batch assembly under learning effect', Y. Cohen, E. Dar-El and G. Vitner investigate the effect of layout and work allocation on the makespan of batches of different products characterised by significant learning.

## **Acknowledgements**

We would be most ungrateful if we do not recognise the high response we received from the authors throughout the globe. Although only about a small percentage of submissions could make it to the publication having undergone rigorous blind review, yet we offer

our most sincere thanks to all the authors who considered this Special Issue as a probable outlet in order to disseminate their research findings. We would again like to extend our heartfelt thanks to all the authors and reviewers who contributed to this Special Issue in one way or other. It was really an arduous task selecting the best among the better papers. We would like to thank Prof. Mohammed Dorgham, Editor in Chief, *International Journal of Intelligent Systems Technologies and Applications (IJISTA)* as without his encouraging assistance in having the prerequisites for the Special Issue, we would not have been able to come up so far. Also, special thanks are also due to Dr. Liz Harris, Manager-IJISTA, for her constant support and required updates. Finally, it would be highly ungracious on our part if we forget to mention the assistance rendered by Research Promotion Cell (RPC), NIFFT, in the form of its dedicated research scholars who helped manage the Special Issue right from its conceptualisation through publishing. At the end, we hope we have been successful in providing insights and state-of-the-art information for current research concerned with AI Applications and Simulation in various Engineering problems. Also, we anticipate stimulating further research in modelling and solving various facets of engineering design, management, logistics and supply chains utilising the emerging AI and Simulation tools.