Editorial

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Agility in manufacturing is one of the many profound qualities companies must possess to succeed in a turbulent business environment. Businesses worldwide are constantly faced with the challenge of offering the ideal product variety in their supply chain because of the conflicting interests between manufacturing and marketing. Although mass customisation is ideally desirable from a customer service perspective, it is often accompanied by engineering and manufacturing hurdles arising from product proliferation. Manufacturing strategy has evolved through significant changes that occurred in the latter part of the nineteenth century. Companies no longer adhere to the manufacturing philosophy of capturing market share by producing large volumes of a standardised product. Businesses have realised that responding to the market quickly with specific product-targeting to niche markets will be the crucial factor that will give them a cutting edge over their competitors. The aim of this Special Issue is to identify the research issues for managing manufacturing complexity in light of these global challenges.

The purpose of this Special Issue, entitled ‘Complexity in Manufacturing’, is to promote and disseminate research that deals with managing the issue of complexity problem in both the design and manufacturing domains. It offers researchers and practitioners the most recent concepts, methodologies and techniques in the fields of design and manufacturing.

In the first article, Savachkin, Bakir and Uribe-Sanchez investigated a manufacturing system exposed to unpredicted capacity disruptions with exponentially distributed interoccurrence times and uniformly distributed magnitudes of disruptions. They have explored how the policy of maintaining the optimal disruption rate is affected by a number of system parameters. This article is entitled, 'An optimal countermeasure policy to mitigate random capacity disruptions in a production system'. Saravanan and Haq have addressed the scheduling of manufacturing cells in which parts may need to visit different cells in the second article. A metaheuristic named Scatter Search is proposed to solve the intracell and SVS-algorithm is to intercell-scheduling problem. The results revealed that the scatter search algorithm performs better than heuristic NEH method in the selected benchmark problems with respect to average makespan. This paper is entitled, 'A scatter search method to minimize makespan of cell scheduling problem'. In the third article, Dixit and Mishra have developed a new formulation for part family/machine cell formation problem based on the dynamic nature of the production environment by considering a multiperiod forecast of product mix and demand during the formation of part families and machine cells. The computational procedure of the algorithm has been illustrated by an example. Numerical results indicate that the proposed methodology is flexible, efficient and may be effective even for industrial problems. Their article is entitled, 'Design of flexible manufacturing cell considering uncertain product mix requirement'. Ho and Lin presented a framework for addressing the complexities in integrated enterprise systems implementations. This framework adopts a project life cycle that considers the various aspects of an implementation from design to the realisation and support of an integrated-enterprise system. This framework comprises of and is supported by the Safeguarding subframework, a Critical Success Factor subframework and a Project Lifecycle subframework. These subframeworks help practitioners in various key areas in a project to help ensure the successful design and implementation of the integrated-enterprise system. This is the fourth paper and is entitled 'A practice-oriented integrated-enterprise system implementation framework for the manufacturing environment'. A Reconfigurable Manufacturing System (RMS) is considered to be a new philosophy of manufacturing. RMS is considered as a new strategy or philosophy for manufacturing firms that will allow flexibility not only in producing a variety of products (parts), but also in changing the system itself. In the fifth article, Garbie, Parsaei and Leep focused on the evaluation of manufacturing firms for a needed reconfiguration level based on the level of agility it has and nature of the manufacturing systems design. In order to achieve this objective, a measurement of the needed reconfiguration level will be evaluated using the Analytical Hierarchy Process (AHP). This article is entitled, 'Measurement of needed reconfiguration level for manufacturing firms'. Mass Customisation (MC) is the production of individually customised production at low cost and short lead times. Successful MC requires a complete shift in manufacturing paradigm. A minicell-based manufacturing system is one approach to achieve this flexibility. Due to the various methods available to design the modular minicell configuration, establishing good designs is a complex and time-consuming process. Thuramalla and Badurdeen have established as set of design rules that will identify minicell configurations in order to achieve different performance criteria, without having to explore the entire solution space. The sixth article is entitled, 'Establishing rules to design a minicell-based manufacturing system for mass customization'. The cargo handling process has become an important component of the logistics and supply networks for ports, shipping lines, terminal and warehousing enterprises. In the seventh article entitled, 'Design and analysis of an automated container handling system in seaports', Asef-Vaziri, Khoshnevis and Rahimi presented the design and analysis of an automated container handling system which integrates Automated Storage and Retrieval System and Automated Guided Vehicle Systems for use at seaport terminals. A computer simulation model is developed to examine the key measures of effectiveness such as throughput and space/equipment utilisation. In the eighth article entitled, 'Task assignment and scheduling in a constrained manufacturing system using GA'. Choudhury, Mishra and Biswal have developed a genetic algorithm-based model to optimise the scheduling of Flexible Manufacturing Systems. This approach is used to determine the best available combination for processing the product. The proposed methodology included the analysis of parts to be produced by the FMS, detailing the machining processes involved in manufacture of the parts, GA-based methodology for scheduling and finally optimising the scheduling time using alternate assignments within FMS. In the ninth article of this Special Issue, Hisham Al-Mubaid, Abouel Nasr and Kamrani in their article entitled, 'Using data mining in the manufacturing systems for CAD model analysis and classification', presented a new approach for mining large quantities of machining features, CAD models and manufacturing data. The approach uses learning-logic classification techniques for mining 3D CAD data. The proposed approach was evaluated in CAD model analysis, specifically in classification tasks. The experimental results proved that the method is effective in terms of classification accuracy and can be used as an efficient data mining tool for CAD model analysis and classification. Cellular Manufacturing (CM) system has been recognised as an efffective way to improve productivity in a factory. In the next article enetiled, 'Combining axiomatic design and designed experiments for cellular manufacturing systems design framework', Hachicha, Masmoudi and Haddar have developed a framework for design of celluelar manufacturing using inetgrated axiomatic and experimentral design. The work is further illustrated using an example. Finally, in the last article by Hassan entitled, 'Optimising the Gaussian-distributed filling process parameters', the problem of filling process is investigated. First, a closed-form analytical solution to find the optimal process mean is developed. The advantage of this solution comes from its ease of use by practitioners since it just needs simple calculations and use of graphs, developed here, to find the required optimum mean. The solution model is then extended to include a variance reduction cost function. The extended model is reduced to a semi-analytical solution that results in optimal process parameters realising the minimum overall costs.

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