Editorial

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Biographical notes: Ali K. Kamrani is an Associate Professor of Industrial Engineering, the Director of Industrial Engineering Accelerated BS to MS Program Studies and the Founding Director of the Design and Free Form Fabrication Laboratory at the University of Houston. He received his BS in Electrical Engineering in 1984, Master of Engineering in Electrical Engineering in 1985, Master of Engineering in Computer Science and Engineering Mathematics in 1987 and PhD in Industrial Engineering in 1991, all from the University of Louisville, Louisville, Kentucky. His research has been motivated by the fundamental application of systems engineering and its application in advanced design and complex systems.

The engineering design process includes a set of activities arranged in a specific order with the clearly identified inputs and outputs. The objective of this process is to satisfy customer requirements and management objectives. This process is considered efficient when output of the process satisfies general customer and defined requirements, meets management objectives and customer deadlines, and all these with reduced costs and resources. For this purpose, many companies have established a concurrent design process for their products. Technologies such as rapid prototyping (RP), rapid tooling and rapid manufacturing (RM) are designed to support this systematic and integrated cycle.

The next technological evolution in the RP technology is the RM. RM is the automated fabrication of products directly from digital data. Some RM processes make use of available RP technologies to manufacture finished parts. Some new technologies have also been developed in support of the RM applications. The main advantage of RM is its ability to produce customised parts. Studies have shown that many companies and agencies are considering the applicability of RM technologies to produce customised products. Conventional manufacturing technologies such as mass production are the most economical approach for production of large volume of components, although for high variety components (customised parts) this method is infeasible due to the high cost of operations. RM has the ability to produce large amounts of customised parts at a relatively low cost.

The purpose of this special issue is the publication of research reports and application descriptions in the advancement of RM technologies and its impact on the engineering design process including manufacturing and automation for the 21st century's customer-focused product.

In the first article entitled, 'Evolutions of rapid product development with rapid manufacturing: concepts and applications', Bernard, Taillandier and Karunakaran presented the evolution factors, methods and technologies for today's rapid product development, and mainly about RM, including metallic part manufacturing. It concludes that with the current evolution of the capacities for RM technologies the scope of new product design and manufacturing is greatly enhanced.

In the second article entitled, 'Optimising the automated plasma cutting process by design of experiments', Asiabanpour, Vejandla, Jimenez and Novoa present the results of an ongoing research to discover the relevant factors that affect the part's surface quality characteristics and the optimum machine settings by implementing a 'design of experiments' and following a 'response surface methodology' approach. Final results identified an optimal machine configuration that facilitates the fabrication of parts with close-to-perfect quality for all the 18 quality responses considered.

In the third article entitled, 'Conventional machining methods for rapid prototyping and direct manufacturing', Yang, Wysk, Joshi, Frank and Petrzelka present an overview of how conventional machining processes can be used for RP and direct manufacturing processes. The methodologies of CNC-RP and WEDM-RP are presented in this paper.

The fourth article is entitled 'Parametric modelling and simulation of rapid prototyping'. In this article, Kumar, Rao and Reddy propose a virtual system for parametric modelling and simulation of RP process. The system aims to reduce the manufacturing risks of prototypes early in a product development cycle, and hence, reduce the number of costly design-build-test cycles.

The fifth article is entitled 'Dimensional deviations of machine parts produced in laser sintering technology', and it is written by Kotlinski, Kesy, Kesy, Jackson and Parkin. This study concerns assessment of dimensional deviations of machine parts produced in 'laser sintering' technology. The results have indicated that some dimensional deviations considerably exceed permissible deviations provided by technical documentation for laser sintering technology; although the research is limited to specific equipment and materials.

In the final article entitled, 'Investigating the design and development of truly agile flexible fixtures based on electrorheological fluids', the results of the latest studies in design of flexible fixturing systems is presented. It presents a novel concept of designing truly flexible fixtures by harnessing the power of phase-change and mechanical properties of the advanced electrorheological (ER) fluids. This article is written by Kamarthi, Bhole and Zeid.

I would like to thank the reviewers of this special issue. Without their assistance this project would not have been possible. I would also like to thank Dr. Dorgham and Mr. Jim Corlett from Inderscience Publishers for their support and assistance. Finally, I would like to thank our contributors by allowing us to share the results of their research with the rest of the business and engineering communities.