Editorial: e-manufacturing and mass customisation

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Abstract: This editorial gives readers a brief introduction to the scope and contents of six papers selected for the special issue on e-manufacturing and mass customisation in the international journal of Manufacturing Technology and Management. It would be helpful for the readers to understand the current research progresses and perspectives concerning the topic above-mentioned.

Keywords: e-manufacturing; mass customisation; Kansei; e-service; process planning; surface micro-manufacturing; automotive industry; porous ceramics implants; injection moulded products.

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Biographical notes: Pingyu Jiang is a Professor at state key laboratory for manufacturing systems engineering at Xi'an Jiatong University, China. He received his PhD in Mechanical Engineering from Xi'an Jiaotong University, China in 1991 and was promoted to a full professor in 1999. Professor Jiang is the author and co-author of over 60 journal papers, two teaching textbooks and one monograph. Since 2003, he has been a member of editorial board for both *International Journal of Manufacturing Technology and Management* and *International Journal of Mass Customisation*. His main research interests include e-manufacturing, virtual manufacturing, product design methodologies like product platform design for mass customisation and MEMS design.

The aim of organising this Special Issue is to provide a forum for researchers to report current achievements and identify possible directions for further developments and industrial practices in the areas of e-manufacturing and mass customisation.

Nowadays both globalisation and customisation are being identified as key factors for manufacturing industry to go the success in the 21st century. With drastic competition in global markets, it is so popular that manufacturing activities are separated geographically in different places or countries. Using internet and world wide web technologies for enhancing the manufacturing capabilities of enterprises has been becoming so common that it would bring many benefits for enterprises. However, doing manufacturing activities on internet/web firstly needs to employ a lot of enabling technologies which deal with modelling transparent and trackable activity chains, using efficient activity

solving mechanisms, realising easy communication, executing collaboration via both customers' and suppliers' participation, establishing uniformed digitalised representation and storage of product and process data, calculating manufacturing costs accurately through e-commerce and so on. It also needs to integrate all enabling technologies into a novel manufacturing mode, which is powered with a robust manufacturing infrastructure. A point to be mentioned here is e-manufacturing mode can reach a 24-hr-per-day online manufacturing activities on internet/web and satisfy the needs of both globalisation and online customers' participation. Furthermore, introducing mass customisation technology into e-manufacturing mode can implement the mass production of various customised products under the e-manufacturing environment so as to speed up the delivery of products. So it is very obvious that integrating e-manufacturing with mass customisation would construct a new milestone for manufacturing industries. Taking into consideration of some key problems which need to solve, we just set up the following subject coverage for call for papers:

- reference model and infrastructure for e-manufacturing
- dynamic configuration of networked manufacturing execution systems
- web-based CAD/CAPP/CAM delivery
- e-service engineering in manufacturing
- digital technologies in remote manufacturing monitoring and diagnosing
- web-based manufacturing for made-by-order
- friendly man–machine interface and communication in e-manufacturing and mass customisation
- methodologies and models for integrating e-manufacturing with e-business process
- acquisition of customers' requirements with the Kansei method and others
- design methodologies for product platforms
- product configuration issues concerning mass customisation
- organisational issues on mass customisation
- reconfigurable manufacturing execution systems for mass customisation
- clustering issues in mass customisation
- computing intelligence in manufacturing and
- e-manufacturing modes suitable for mass customisation.

Aiming at solving some of the above key problems concerning e-manufacturing and mass customisation, finally, this Special Issue of IJMTM chooses six research papers which are submitted from the UK, Germany, Japan and China.

In the first paper titled "An evaluation method for the identification of flexible production technologies for mass customisation in the automotive industry", Guenther Schuh et al. give us a report on how to use the principle of mass customisation to the automotive industries. Here, an evaluation method for the identification of feasible production technologies is discussed in detail, which includes defining a

customer-oriented product programme, using conjoint-analysis to classify the customer requirements, selecting suitable product structure, and describing database construction criteria and finally choosing flexible production technologies related to implementing the logic of mass customisation.

In general, customers' emotion to either exact or on-paper products would directly decide what kinds of their requirements are acquired. With the help of statistics and the correspondent factor analysis methods, Kansei engineering has been used to map customers' emotion information into product structure and shape details. It is also clear that Kansei engineering is a powerful tool to make the mass customisation become true from the angle of customers' requirement representation. Starting from this point of view, the second paper "Design optimisation for customers' KANSEI requirement: application of Interactive Reduct Evolutional Computation (IREC) to industrial design with curves" by Hideyoshi Yanagisawa and Shuichi Fukuda describes a design methodology for evolving on user's psychological preferences be means of using IREC. Customers' intent is connected with geometric shape attributes through a kind of combined intelligent computing model which depends on both rough set theory and genetic algorithm. As verification, an example concerning automobile side-board shape design is shown in order to demonstrate the usefulness of this methodology.

It has to be mentioned here that we still have not found a very efficient way to establish a web-based information acquiring, up-streaming and tracking mechanism for extended enterprises so far. The key problems are that current models and software tools are not completely suitable for new requirements, especially after introducing e-manufacturing technology to the reality. Pingyu Jiang and Bing Chen just present an e-service-driven e-manufacturing solution in the third paper "Some key issues on enabling e-manufacturing as a part of product-driven e-business process via e-service". Two models, that is, the e-formalisation of digitalised machining equipments and the tree representation of extended enterprise, are discussed in detail. On the basis of these models, the configuring mechanism of product-driven extended enterprise and the correspondent global tracking method of manufacturing data are also put forward.

In the fourth paper named "Knowledge web based system to support e-manufacturing of injection moulded products" by Karina Rodriguez and Ahmed Al-Ashaab, the research on developing a digitalised representation model of product life cycle knowledge is presented so as to support the e-manufacturing of injection moulding products. This knowledge model is also used as the kernel to drive a knowledge-based collaborative product development in a global engineering environment.

The concept of e-manufacturing has also been applied to many different engineering fields so far, especially where customers need to join relevant e-manufacturing activities. The follow-up two papers just show us two specific applications, respectively, for bio-manufacturing and surface micro-manufacturing.

In the fifth paper "Custom-made production of porous ceramics implants towards e-manufacturing" by Teruaki Ito and Teisuke Sato, a virtual design model for bone formation is put forward, which deals with designing custom-made shapes on hard-tissue implants (design issue) and using porous ceramics for hard-tissue implants (material issue). Furthermore, a framework towards e-manufacturing of custom-made ceramics implants is proposed.

In the last paper "Developing an e-service-based CAPP system for silicon surface micro-manufacturing", Pingyu Jiang and Xuesong Qi just put forward a methodology to develop the micro-manufacturing process planning system on the web. Correspondent

key enabling techniques mentioned in the paper include formalising process plan space, constructing supporting database and running process planning procedure. Here, sectioning layers on the geometric model, using the BP neural network to generate 'process' flow, itemising 'operation' set related to a 'process' under the support of rule-based reasoning, and generating masks are four important functions to finish the process planning activities.

To sum up, we can say that the current progresses on both theory researches and industrial practices would make the concept of e-manufacturing and mass customisation true and enhance the capabilities of manufacturing industries to meet with the needs of market globalisation and product individualisation.

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