Editorial

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Biographical notes: Lihui Wang is a Professor of Sustainable Manufacturing at KTH Royal Institute of Technology, Sweden. His research interests are focused on cloud manufacturing, web-based monitoring and control, human-robot collaborations, and adaptive process planning. The ultimate goal of his research is to achieve better sustainability in manufacturing. He is a Fellow of Society of Manufacturing Engineers (SME), Fellow of American Society of Mechanical Engineers (ASME), member of CIRP (International Academy for Production Engineering), Board Director of North American Manufacturing Research Institution, and Professional Engineer in Canada. His accomplishments have won him 15 international and institutional awards.

Xun Xu is a Professor at the University of Auckland, New Zealand. He is an internationally recognised expert in smart machining systems and cloud manufacturing. Over the years, he has been actively engaged in various industrial consultancy works, both locally and internationally. He sits on the editorial boards of a number of elite international journals and has published over 200 research papers. Currently, he is the Programme Leader of the University of Auckland 'Innovative Manufacturing and Materials' Programme. He is the Fellow of American Society for Mechanical Engineers (ASME), and Fellow of Institute of Professional Engineers New Zealand (IPENZ).

Cloud computing (e.g., software as a service – SaaS, platform as a service – PaaS and infrastructure as a service – IaaS) is a new-generation service-oriented technology to support multiple companies to deploy and manage services for accessing and exploiting over the Internet. Cloud computing for manufacturing, or cloud manufacturing, would provide a cost-effective, flexible and scalable solution to companies by sharing complex manufacturing software with lower support and maintenance costs. Recently, cloud manufacturing has attracted worldwide attentions and emerged as an imperative research area for developing comprehensive and user-friendly services for factories of the future. Considerable advances have been achieved. Nevertheless, at present this technology is still not mature enough and many challenges remain to be addressed. In an effort to bring

cloud manufacturing to practice, active research work is being conducted in the following areas:

- cloud platform and architecture design
- semantics and ontology of cloud manufacturing
- virtualisation of manufacturing resources
- knowledge management in cloud manufacturing
- case studies in cloud manufacturing.

This special issue aims to collect the state-of-the-art of cloud manufacturing research and identify challenges and directions for the future. It contains six finally-accepted papers covering a spectrum of the above research topics that are essential to cloud manufacturing. The main feature of each paper is briefly stated below:

- The first paper 'Virtualise manufacturing capabilities in the cloud: requirements, architecture and implementation' by Wang and Xu presents manufacturing resources, abilities and relevant essentials from the service-oriented perspective. The functional requirements of a cloud manufacturing environment are also discussed, along with a proposed interoperable manufacturing system framework.
- The second paper 'Cloud manufacturing in China: a literature survey' by Lin et al. reports a broad perspective of the research on cloud manufacturing in China. The topics surveyed include design of cloud manufacturing architecture, resource and capability virtualisation, combinatorial optimisation of virtual resource and capability, design and collaboration of cloud manufacturing services, intelligent searching and matching methods and trust evaluation. Two cases successfully applying cloud manufacturing in industry are also presented.
- The third paper 'Connecting factories and related IT environments to manufacturing clouds' by Rauschecker et al. suggests a concept for a configurable interface component, i.e., factory adapter which enables easy configuration and execution of data exchange between factory-internal IT systems and manufacturing clouds.
- The fourth paper 'Research of knowledge management in a cloud manufacturing system' by Hu et al. focuses on knowledge management in cloud manufacturing. The forms, characteristics and functions of knowledge are analysed. Knowledge acquisition and retrieval are also reported. A case study is carried out to verify their developed knowledge management system.
- The fifth paper 'User friendly development architecture for standardised modelling: STEP toolbox' by Li et al. introduces a development architecture, STEP toolbox, which enables users to implement information standards via a simplified process and minimised knowledge requirements in cloud-based systems. The STEP toolbox consists of conceptual modelling and an object-oriented application programming interface (API).
- The sixth paper 'Ontology for manufacturing resources in a cloud environment' by Lu et al. proposes an ontology-based approach to enable semantic interoperability throughout the whole process of service provision in the clouds. The detailed

requirements for enabling cloud-based data exchange are discussed. A generic ontology development process is then presented with a special focus on reusing existing international and/or industrial standards. The utilisation of the proposed ontology in resource virtualisation and resource retrieval in cloud manufacturing environments is also elaborated.

Finally, the guest editors would like to take this opportunity to thank all the authors for their high-quality contributions to the special issue as well as the many anonymous referees for their time and insightful review comments.