Editorial: manufacturing enterprise computing, integration and management

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Operations and Logistics, and Informatics and General Co-Chair of *2006 IEEE International Conference on Service Operations and Logistics and Informatics*. He is also the Editor-in-Chief for *International Journal of Services Operations and Informatics* and an Associate Editor for *IEEE Transactions on System, Man and Cybernetics* and *IEEE Transactions on Industrial Informatics*.

Dr. Jun Ni is the Shien-Miing (Sam) Wu Collegiate Professor of Manufacturing and also a Professor of Mechanical Engineering at the University of Michigan. He serves as the Director of S-M. Wu Manufacturing Research Center, the Deputy Director of NSF ERC for Reconfigurable Manufacturing Systems and the Co-Director of a multi-campus NSF I/UCRC for Intelligent Maintenance Systems. Among the many honours and awards that he received is the 1994 Presidential Faculty Fellows Award from the Former US President Clinton. He is a fellow of ASME and SME respectively. He is also recipient of the honour to serve as the Cheung-Keung Scholar by the Ministry of Education of China in 1999 and Distinguished Visiting Chair Professorship at Hong Kong Polytechnic University in 2001. He has also been invited to serve as advisory/guest professor at seven Chinese universities including Shanghai Jiao Tong University and Tsinghua University. Since 1996, he has been helping the establishment of a partnership between the University of Michigan and Shanghai Jiao Tong University. His research and teaching interests are in the area of manufacturing science and engineering, with special focuses on precision machining, manufacturing process modelling and control, statistical quality design and improvement, micro/meso systems and manufacturing processes and intelligent monitoring and maintenance systems. He has published over 200 archival technical journal and conference papers, and book chapters. He has supervised 46 doctoral and 35 master graduates as a chair or co-chair.

Dr. Jay Lee is Ohio Eminent Scholar and L.W. Scott Alter Chair Professor of Advanced Manufacturing at the University of Cincinnati and is the Founding Director of National Science Foundation (NSF) Industry/University Cooperative Research Center (I/UCRC) on Intelligent Maintenance Systems (IMS www.imscenter.net) which is a multi-campus NSF Center of Excellence between the University of Cincinnati (lead institution), the University of Michigan and the University of Missouri-Rolla. In addition, he serves as a Changjiang Chair Professor and a Co-Director of Industrial Innovation Center (IIC) at Shanghai Jiao Tong University (www.iicsjtu.com). Previously, he held a position as Wisconsin Distinguished Professor and Rockwell Automation Professor at the University of Wisconsin-Milwaukee. Prior to joining UWM, he served as R&D Director for Product Development and Manufacturing Department at United Technologies Research Center (UTRC), E. Hartford, CT and served as programme director at NSF. His current research focuses on smart prognostics technologies including predictive machine degradation assessment, remote monitoring, embedded prognostics and self-maintenance systems. He received his BS degree from Taiwan, MS in Mechanical Engineering from the University of Wisconsin-Madison, MS in Industrial Management from the State University of New York at Stony Brook and DSc in Mechanical Engineering from the George Washington University. He received Milwaukee Mayor Technology Award in 2003 and was a recipient of SME Outstanding Young Manufacturing Engineering Award in 1992. He is also a Fellow of ASME and SME.

Li Zheng received his BS and PhD from Tsinghua University, China, in 1986 and 1991, respectively. Currently, he is a Professor in the Department of Industrial Engineering, Tsinghua University, China. He was a Visiting Professor in Georgia Tech during 1994–1996. He has authored/co-authored

over 100 papers and three book chapters. His research interests include production and operation planning and scheduling, production system analysis and information Driven manufacturing. He won several important awards such as the National Invention Award in 1990, Excellence Young Faculty Award from MOE in 2000, the National S&T Advancement Award in 2005 and The Governmental (The state council of PR China) special subsidy in 2002. He is a member of the Institute of Industrial Engineers (IIE) and founding chair of IIE, China Chapter.

Ming Yu received his BEng and MEng in Machine Design and Manufacturing Automation from Tsinghua University, Beijing, China in 1983 and 1986, respectively. He has over 11 years of work experience as a teacher from 1986 to 1995 and since January 2000. He is in Tsinghua University to give lecture in areas of management information systems, production management, project management, system engineering and manufacturing process design. He used to work as a manager in-charge of project management in CIMS office, one of subjects within National High-Technology. Programme framework for five years in the early 1990s. He did his PhD research as an assistant researcher in CIMRU, NUI, Galway and graduated in 2000 with a PhD in Industrial Engineering in the area of Change/Innovation Management. Currently, he is an Associate Professor in the Department of Industrial Engineering, Tsinghua University. He also attended many research projects and applications, dealing with areas, such as MIS, ERP, CAPP/CNC/CAD/CAM integration, CIMS, SCM, BPR, Change/Innovation Management, Project Management, etc.

Nowadays manufacturing enterprises must aggregate products and services into total solutions by deploying complete a value chain to fulfil customers' needs. The ultimate goal of applying enterprise information integration solutions to manufacturing is to enable the discovery, design, deployment, execution, operation, monitoring, optimisation, analysis, transformation and creation of coordinated manufacturing business processes across the value chain. Note that deploying integrated enterprise management and manufacturing systems relies on the delivery of the right data, information and knowledge to the right user at the point of work in a timely manner.

However, manufacturing enterprise integration in practice is currently time-consuming, costly and inconsistently, which results in many integrated systems that lack:

1 essential flexibility and agility in adapting to market fluctuations and

2 capability of evolving as technologies advance.

Recently, a lot of research advances in manufacturing enterprise computing, integration and management have been made. The results of the advances bring up a new class of mission-critical infrastructures, a new category of manufacturing integration methods and software and a new group of business platforms for better exploiting and managing manufacturing business processes.

This special issue aims at bringing together the latest research on the emerging sciences and technologies in manufacturing enterprise computing, integration and management from the leading scholars worldwide. After going through independent peer reviews, 12 research papers are selected for this publication, covering a variety of research interests from supply chain networks, resource management and coordination,

manufacturing process integration, enterprise integration framework and methodology, shop floor scheduling and execution, to system flexibility and responsiveness, product customisation knowledge engineering and manufacturing optimisation.

A manufacturing value chain can be essentially defined as a supply chain. Most of the literature studies cover a variety of research work done during the last decade or before. Different from traditional approaches, Li et al. discuss the concept of 'self-organisation evolution of supply networks'. A comprehensive modelling of the proposed supply network evolution is introduced. They discover that the evolution of a supply network is self-reinforcing and path-dependent while highly sensitive to its initial settings. However, the evolution result is non-deterministic. Srinivas and Rao then specifically focus on the modelling of consignment stock policy with controllable lead time for inventory management on the supply chain. A lead time of consignment stock strategy is proposed for inventory control on the supply chain to retain a competitive advantage in today's dynamic business environment.

Owing to the lack of standard approach to integrating manufacturing information systems throughout the supply chain, manufacturing enterprise integration has been mainly conducted using proprietary approaches. The integration is typically expensive and time-consuming while resulting in the integrated manufacturing systems with a little business agility. Qiu proposes a service-oriented integration framework for facilitating the integration of semiconductor manufacturing systems. By taking advantage of the advances of open computing service architecture, business process management principles and networked computing technology, interoperable production services can be defined. When production services are integrated through the proposed framework across factories, an integrated automated semiconductor manufacturing system can substantially increase its productivity, efficiency and business agility. Qing et al. then define an hierarchical framework for enhancing business process model management and reuse. By applying the latest development in computing technology, Anicic et al. propose a set of standards using ontology aimed at realising semantic enterprise application integration for better interoperability throughout the value chain.

Manufacturing business competitiveness highly depends on effective business operations highlighted by the conduct of a variety of organisational executions. As more and more customers like to order customised products, meeting customisation requirements becomes a necessity to a manufacturer to be differentiated from competitors. Dan and Tseng propose a systematic approach by defining flexibility index to assess the inherent flexibility of product families for meeting the needs of mass customisation in manufacturing. To improve the scheduling on the shop floor, Zhou et al. present a biological intelligent scheduling algorithm for shop floor production controls. To make the algorithm practical, batch size and non-cutting time are fully considered during their investigation. Mukhopadhyay and Panda then specifically apply the theory of constraints in improving the productivity of a manufacturing system. Sandanayake and Oduoza introduce a new methodology to analyse the impact of Just-in-Time (JIT) factors in manufacturing. To help manufacturers optimise their manufacturing practices, a generic model has been developed for capturing and identifying these factors that highly influence manufacturing performance in a JIT operational environment.

Some specifically focused research areas in manufacturing have also drawn a lot of attentions from scholars. Wei and Chen design a new decision-making methodology for the design and manufacturing of aluminium profile products. By incorporating the latest advances in concurrent engineering and knowledge-based engineering, they develop an

intelligent decision support system aimed at replacing experience-based decision making during the product development cycle. Lin and Ho study a strategy for improving the Cpk of DRAM modules in depanel process of PCBA. Lin and Lee create an optimised design reference for die design using neural networks.

The process of delivering a quality journal issue on a focused topic requires a significant amount of support and help from many people. The Guest Editors thank the reviewers whose peer reviews help retain the high quality of the special issue. The Guest Editors are also grateful to the assistance from the secretariat of Division of Engineering, Penn State Great Valley.