Editorial

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Biographical notes: Charalampos Makatsoris is a Senior Lecturer and the Head of Research for the Advanced Manufacturing division in the School of Engineering and Design at Brunel University. He is a Chartered Engineer and a graduate from the Mechanical Engineering Department of Imperial College London. He has over 14 years work experience most being in leading teams both in industry and academia involving interdisciplinary research that requires integration and coordination. He is also the Director of the research centre LIFEPASS, concerned with systems for sustainable manufacture. He has published 43 papers. His research interests are wide and include robotics, mechatronics and multi-scale control of manufacturing systems.

Modern enterprises operate in complex environments where they have to address increasing demands for highly customised, innovative yet low-cost products, complex relationships with customers, suppliers and service providers, competition from low labour cost countries, fast changes in technology and environmental and energy considerations. This creates strong dependencies on organisational and business networks as well as on technology, which has become more pervasive in commerce and industry than ever before. To respond to these complexities manufacturing organisations are currently operating within, they create federal partnerships aiming at virtually pooling and time-sharing resources. Within such relationships, there are many instances that engagements remain dormant but overall are dynamic and are enabled on demand. The enterprise network remains, however, always active and can thus be described as an *Adaptive Value Network* (AVN), a term first introduced by Makatsoris et al. (2004) to describe this new type of relationships. The AVN has been defined as (Makatsoris et al., 2004):

> "An arrangement where companies form a web of close relationships and work together as a system that delivers the right customised product and expected service as the right quality in a coordinated manner and are responsive and adaptable to changes in the environment."

Such engagements can lead not only to significant financial gains but also in enterprise networks that are robust and resilient to changes, market fluctuations as well as threats, especially in industries that are critical. However, such networks require enabling technology and new methodologies and management approaches to become effective.

Although such new tools become increasingly available, they have to be integrated and deployed appropriately to organisations with respect to their stage of organisational development and technological maturity.

The field of *Enterprise Engineering* is a growing, interdisciplinary engineering theme, which aims at the understanding and the management of complexity in the new enterprise, especially the networked enterprise. This entails the complete analysis, understanding and design of large-scale, integrated and sustainable systems that comprise interacting units such as nodes, components and sub-systems and operate across variable time and length scales. The systematic study of these interactions and the design and delivery of relevant combination of technology and approaches into solutions requires new type of multi-disciplinary skills and a toolset including:

- modelling and simulation
- optimisation and control
- design and risk-analysis
- management approaches and theories applicable for networked enterprises and production
- technology management and evaluation
- understanding of corporate structures and strategy and the subsequent ability to design and deliver holistic solutions to deliver it.

This new field of engineering thus requires management as well as systems engineering skills. A number of universities are currently offering related postgraduate courses or doctoral research to train new graduates with precisely those skills. A number of those are members of the Council of Engineering Systems Universities (CESUN, 2010). The institutions of contributors to this special issue also provide this type of training and skills.

These new trends open up new opportunities for research, especially in the technology area and it is the aim of this special issue to present recent developments in enabling technologies and approaches. The papers presented in this special issue are a selection of appropriately expanded papers presented in the proceedings of the 6th International Conference on Manufacturing Research (Cheng et al., 2008). The papers selected represent a cross section of relevant state-of-the-art research in the area and have been collated to provide a reference for researchers as well as to practitioners and indicate current and future research directions in this new and growing field of engineering. More than 20 authors have been originally invited to submit extended versions. Almost all submissions have been of very high quality but the size limitations of this publication dictated to reject several and publish the ones that we thought are a representative sample of the research that currently takes place in the area. The sample ranges from technical papers to new management approaches and theories and to best practice studies.

The paper entitled ‘RFID- and WSN-based intelligent cold chain management’ by Aung et al. presents a monitoring system for the cold chain. The system is utilising ubiquitous sensing technologies, radio frequency identification and wireless sensor network technologies to monitor product flows in cold chains. The paper presents the

design of the system at the software as well as the hardware level and also discusses application areas of this technology in networked enterprises.

In 'Low Carbon Manufacturing: characterisation, theoretical models and implementation', the authors Tridech and Cheng have modelled the relationships between resource utilisation and carbon emissions in manufacturing chains. The aim is to provide an understanding of the impact of shop floor decisions to the carbon footprint of the company and that of the supply chain.

In the third paper entitled 'Supply network integration in multi-organisational network systems', the author J.S. Srai explores the critical issues in supply network integration in complex product service systems. The paper presents four case studies from a variety of sectors including aerospace, shipbuilding and telecoms. Within this work, a pilot approach aiming at new perspectives into the alignment of objectives of the various entities and at capturing those within a 'hierarchy' of strategic, operational and routine activities.

The following paper with title 'Human systems modelling in support of enterprise engineering' by Khalil et al. presents a modelling framework and graphical tools to support human system engineering. With their approach, the authors systematically decompose and represent processes so as to model elemental activities as explicit descriptions of roles that human systems can occupy as role holders. The model is then used to facilitate quantitative analysis and comparison of different human system configurations, so that their behaviours can closely match specific, explicitly defined, requirements of manufacturing workplaces.

Then in 'Integrating the Last Order Costing model into a lean framework', Davies et al. present a structured methodology, which aims at addressing the identification and minimisation of total production costs and waste within a company. In their approach, labour, materials and overheads are taken into account as they are enablers to maintaining competitive advantage in the longer term, by creating a wider margin between in-house costs and market prices.

In the final paper, 'Exploring the adoption and implementation of discrete and integrated IT systems: a framework for analysis', Burns and Hewitt-Dundas explore whether integrated organisational information systems are delivering the performance benefits vendors have been promising. The authors address the limitations of current research in the area by combining both factor and process research in a new type model of Information Technology (IT) implementation. By means of this model, the authors argue that integrated IT differs substantially from traditional discrete IT with respect to organisational factors, which determine the successful implementation of these types of systems. Furthermore, they argue that failure to manage these differences is a major source of failure in the implementation of such systems.

I am grateful to the authors for their contributions and importantly for their patience during the long editing process that has led to the final manuscripts in this publication. Finally, my sincere appreciation to Professor Lihui Wang, the journal's Editor-In-Chief, for the steadfast support and undiminished interest throughout the preparation of the special issue.

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