



Special Issue: "Collaborative Product Development"

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Special Issue: “Collaborative Product Development”**Benoit Eynard^{1,*} and Xiu-Tian Yan²**

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At the time of rapid globalization of manufacturing industries and trade, many leading multinational companies have to work together with their geographically distributed partners, subsidiaries, or joint ventures to improve their competitiveness and productivity. This new collaborative working have improved the efficiencies of their manufacturing operations, increased the market share of their products at the same time in most cases, and more importantly stimulated the speed of technological innovation and enhanced product customization to satisfy increasingly varying customer demands. The needs for an efficient and close collaboration among product development stakeholders in this context present a major research challenge and at the same time many opportunities for many multinational companies of numerous industrial sectors (aeronautics, automotive, consumer goods, electronics, etc.). Associated technologies to facilitate this collaboration are also required to be made available. It is clear that a better understanding of the key research issues in the collaborative product development (CPD) for complex product development in a distributed environment and a provision of working solutions will advance state-of-the-art knowledge in this field and address the urgent industrial needs effectively.

The current advancement in information and communication technology especially internet and web-based technologies enable the geographically distributed and remote project groups to exchange and share product data and information in an extended enterprise or a network of companies around the clock. Those comprehensive data and information increasingly

allow designers and product developers to generate and evaluate product solutions more effectively and efficiently. The information often covers a wide range of design and manufacture phases and issues, including the product definition of the whole product lifecycle.

In addition, business globalization and specialization in order to focus on its core business of each organization have resulted in a demanding requirement for wider collaboration and cooperation. Business globalization requires companies to maximize the coverage of market with the same or similar product design solution. This often implies that at the early stage of the product development, requirements to address different market needs in different part of the world should be considered at this early stage. With use of modular design approaches and other design methodologies, modular products may be produced to address slightly variable needs using same product platform.

Under these technological developments, new social change for customized products and rapidly changing market demands, CPD has been considered to be a solution. It thus can be seen as a holistically integrated design and manufacture process with a high level of coordination and is characterized by distributed working, aiming to address related product development issues of its whole life-cycle. The following life-cycle stages are of particular interests to many enterprises, namely, wide customer requirements clarification, preliminary and innovative design, rigorously defined detail design, lean production planning and engineering, cost effective product service engineering, and any other relevant life-cycle phases. Additionally, the capture and integration of knowledge and practical know-how in phases such as manufacturing, assembly, maintenance, recycling, etc. into the collaborative

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product development framework is imperative to the success of more responsive and agile companies in very competitive global commercial markets.

Having publicized a call for paper for this timely important research area, the Guest Editors have received a large number of relevant papers. After an extensive review of the received papers by international experts and a careful selection based on these reviews, the Guest Editors of this special issue are delighted to present seven timely papers selected and modified for the Special Issue. These papers address a wide range of topics in collaborative product development. They can, however, be categorized and have been grouped into the following three sections to highlight three important research areas: namely generic approaches and issues in collaborative product development; IT and their applications in collaborative product development; and finally collaborative process engineering and manufacture.

In the first group, M. Zolghadri, C. Baron, and Ph. Girard argue for the need of co-design as a concept of a parallel development of product design process and partner network design during collaborative product development and associated benefits. They also show how a number of techniques can be used to support collaborative design in their approach, including how to establish network design team and identify and support critical partners. A. Lindquist, H. Berglund, and F. Johannesson present issues and findings in involving and facilitating sub-suppliers in collaborative platform development as early as possible so that a competitive edge can be achieved. They tackle this complex collaborative product development research issue specific for a platform-based design scenarios from their Swedish research experience, where the same product platform could be required and used for multiple brands developed in a collaborative manner. A.M. Maier, A. Kreimeyer, C. Hepperle, C.M. Eckert, U. Lindemann, and P.J. Clarkson investigate the key means for collaborative product development – communication. They explore the factors influencing communication in complex product development through five empirical studies in some key industrial sectors, including aerospace, automotive and IT industries. They show how these factors influence communication in collaborative product development.

In the area of IT and collaborative product development, N. Bouikni, L. Rivest, and A. Desrochers study the requirements of generating multiple views to support multi-disciplinary team working, using information processing techniques. They show the techniques of creating design, manufacture and structural views, which can be used to support different functions of a multidisciplinary team design team. P. Jiang, X. Shao, H. Qiu, and P. Li present a Time Colored Petri Net technique to support cross-organizational workflow

construction and enable the interoperability of distributed workflow management systems for collaborative working among partners.

In the Collaborative Process Engineering and Manufacture Development area, S. Ammar-Khodja, N. Perry, and A. Bernard describe a knowledge engineering approach entitled knowledge capitalization which basically captures the essential elements of knowledge engineering, e.g., knowledge elicitation, analysis and structure and so on. This is intended to support the integration of process planning knowledge into a CAD system. V. Zaletelj, A. Sluga, and P. Butala present a framework to support the collaborative design of networked manufacturing systems. They introduce a common modeling space to enable collaborative design, modeling and simulation of distributed manufacturing systems.

During the course of editing this special issue, the Guest Editors have received much support from the Managing Editor of CERA and all invited paper reviewers. The Managing Editor Dr Biren Prasad has been very supportive and helpful. Valuable feedback from him made the selected papers more consistent, representative and to the standard required, which is greatly appreciated. All reviewers' timely review comments and feedback to the editors and authors for all received papers have made it easier and possible to produce this issue on time. The Guest Editors are grateful for their support.

Professor Benoît Eynard

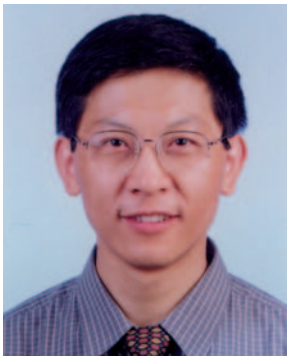


Professor Benoît Eynard (PhD, MDS, MAFM) is currently the head of the Department of Mechanical Systems Engineering at the Université de Technologie de Compiègne, France. He is also member of the Research Centre for Decision Support Systems in Innovation, Design and Production (ODIC).

Previously, he has been Assistant Professor at the Université de Technologie de Troyes and has managed an MSc degree in Information Technology for Mechanical Engineering from 1999 to 2006. In 1999, he received a PhD Degree in the field of engineering design from the Université Bordeaux 1. He has been involved in numerous European Commission funded projects developing research work in the field of concurrent engineering, computer-integrated manufacturing and knowledge management. He is an internationally and nationally recognized researcher in product

lifecycle management and data exchange, collaborative design and digital manufacture, and also engineering knowledge modeling and reuse. From 2004 to 2006, he has been the leader of a research cluster funded by French government and Champagne-Ardenne local government supporting projects focusing on Information Technology and Production Management. He has more than 80 refereed publications in total, including 15 journal papers, 7 edited books and journal special issues, 5 book chapters, and 55 refereed international conference papers. He has been a member of advisory and scientific board of several international conferences. He is a member of the editorial board of the International Journal of Product Lifecycle Management. Last, he has been a technical paper reviewer for numerous international journals and conferences in the above mentioned fields.

Dr Xiu-Tian Yan



Xiu-Tian Yan, PhD, BEng, CEng, MIET (MIEE before 2006), FHEA (MITL), MDS, is a Senior Lecturer in the Department of Design, Manufacture and Engineering Management (DMEM) of the University of Strathclyde. He is also the Deputy Director of Teaching and Learning and Postgraduate Director of the department.

He has been the project General Manager for two and involved in additional one European Commission funded projects, promoting research exchange in engineering design and manufacture in Europe and Asia. These projects involve all together 14 project partners in Europe and Asia. He is an internationally recognized researcher in *proactive computer support of product life-cycle synthesis and product development, constraint-based insightful engineering design support and multiperspective mechatronic system modeling and simulation*. He has been invited to be a technical proposal reviewer for several government research funding bodies. He was also an invited Japanese government STA fellowship in 1999. He was a key researcher working on the UK government funded Schemebuilder project from 1992 to 1994. He has attracted numerous research grants as a principal investigator. He has published widely and regularly with 112 refereed publications in total, including 23 journal papers, 3 edited books, 15 book chapters, and 71 refereed international conference papers. In 2007, he is an Invited Professor and has been a Visiting Associate Professor at the Université de Technologie de Troyes, France, a Guest Professor and PhD adviser (since 2005) and Visiting Professor (since 2003) at Northwestern Polytechnical University, China. He has organized several international conferences/symposium as a Chairman or session chairman for these conferences. He has been a technical paper reviewer for numerous international journals and conferences in his fields for many times. He has also been a member of technical committee of many international conferences in broad engineering design and manufacture research fields.