
Editorial

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Biographical notes: Lars Mönch is a Professor of Computer Science in the Department of Mathematics and Computer Science at the University in Hagen, Germany and heads the Chair of Enterprise-wide Software Systems. He received his Masters in Applied Mathematics and PhD in the same subject from the University of Göttingen, Germany. He received a Habilitation degree in Information Systems from the Technical University of Ilmenau, Germany. His current research interests are in information systems for manufacturing and logistics, simulation-based production control of semiconductor wafer fabrication facilities, applied optimisation and artificial intelligence applications in manufacturing and logistics. He is a member of GI (German Chapter of the ACM), GOR (German Operations Research Society), SCS, INFORMS, IIE, serves as an Associate Editor of *IEEE Transactions on Automation Science and Engineering* and is on the Editorial Board of *European Journal of Industrial Engineering*.

John W. Fowler is the Avnet Professor of Supply Networks and a Professor of Industrial Engineering at Arizona State University (ASU). His research interests include modelling, analysis, and control of manufacturing and service systems. He is the author of over 75 journal publications, 100 conference papers, and ten book chapters. He is the Founding Editor of the new journal *IIE Transactions on Healthcare Systems Engineering*. He is a Fellow of the Institute of Industrial Engineers, the INFORMS Vice President for Chapters/Fora, and is on the Winter Simulation Conference Board of Directors.

Scott Mason is the Fluor Endowed Chair in Supply Chain Optimization and Logistics and Professor of Industrial Engineering at Clemson University. Prior to joining Clemson, he spent ten years at the University of Arkansas. He received his PhD in Industrial Engineering from Arizona State University. His areas of focus include operations planning, scheduling, and control of capital project supply chains and large-scale systems modelling, optimisation, and algorithms, with domain expertise in semiconductor manufacturing. He is a senior member of the Institute for Industrial Engineers and a member of INFORMS.

The 2008 International Conference on Modeling and Analysis of Semiconductor Manufacturing (MASM) was a forum for the exchange of ideas and best practices between researchers and practitioners from around the world involved in modelling and analysis of high tech manufacturing systems. The MASM conference was fully contained within the Winter Simulation Conference (WSC) 2008, the leading conference in discrete event simulation. WSC 2008 took place in Miami, Florida, USA, 8–10 December 2008.

In the face of the challenges driven by Moore's law for continuous cost reduction and technology evolution, novel theoretical developments and empirical studies are needed to maintain profitable growth of the semiconductor industry. In particular, to deal with increasing complexity in processes and materials as well as shorter lifecycles and faster ramps, improvements at all levels are expected to contribute to future cost reductions and industry growth: at the operational level, improvements to equipment and operator productivity are as important as ever. At the system level, capital effectiveness and operational improvements are expected to make very significant strides. And at the strategic level, fab economics and supply chain efficiency promises to magnify equipment and factory level advances upstream and downstream in the business. To achieve this, economical analysis, new statistical methods and enabling computing techniques are required in addition to operations research methods.

The conference was built around the following three tracks:

- 1 operational modelling and simulation
- 2 supply chain management and fab economics
- 3 enabling computing techniques and data mining.

The three-day conference attracted about 80 participants from 12 countries, both from academia and industry, including authors from seven large semiconductor manufacturers. All totalled, 46 papers were selected for presentation at the conference.

This special issue of the *European Journal of Industrial Engineering* is based on high-quality papers presented at the conference consistent with the scope of this journal. It includes papers that span a wide spectrum of modern techniques of industrial engineering in semiconductor manufacturing.

The papers are ordered with respect to their scope of operations and used methodologies. Methodologies include simulation, queueing theory and scheduling techniques. The special issue begins with a survey paper that contains a brief introduction into semiconductor manufacturing, the results of a panel discussion among researchers from academia and industry at MASM 2008, and some recommendations for future research directions.

The paper by Chen-Ritzo et al. deals with decision support by discrete-event simulation in the semiconductor industry. A simulation-based analysis of semiconductor manufacturing with small lot-size and batch tool replacements is described in the paper by Stubbe and Rose. The paper by Hanschke and Zisgen demonstrates that it is possible to use methods from queueing theory in a wide range of applications in semiconductor manufacturing. A scheduling problem for assembling multi-chip packages is discussed in the paper by Lee and Lee. Finally, optimisation approaches for batch scheduling based on a time window decomposition and mixed integer programming are considered in the paper by Klemmt et al.

We would like to thank the referees for this special issue. We would also like to thank the editors and editorial staff of the *European Journal of Industrial Engineering* for their invaluable assistance and support in the preparation of this special issue on advances in modelling and analysis of semiconductor manufacturing.