

SIMULATION, OPTIMIZATION AND AI FOR SEMICONDUCTOR MANUFACTURING AND SUPPLY CHAINS: FOUR DECADES OF PROGRESS AND A VISION FOR THE FUTURE

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ABSTRACT

Semiconductor manufacturing and supply chain processes are one of the most complex but can be considered at the same time also as one of the most rewarding processes in the world. In thousands of detailed unit chemical and physical processes in cleanrooms and under statistical process control chips on wafers emerge and are assembled and tested to components. The Modeling and Analysis of Semiconductor Manufacturing (MASM) conference embedded in the annual Winter Simulation Conference (WSC) was, is, and will be key to understand the optimization and simulation challenges in this domain.

The operating curve management targeting a low variability value and thus enabling a low flow factor - thus speed - and high utilization - thus a good cost position - at the same time has been an early achievement. With discrete-event, agent based, and system dynamic simulations on the four levels (machine, fab, internal and external supply chain) solution options for complex interactions could be proposed based on sophisticated mathematical models running on simulation testbeds like the MIMAC models and their successors. Accurate planning and advanced scheduling, available to promise (ATP) generation and usage with traditional or artificial intelligence (AI) / deep learning (DL) methods requires a huge amount of real data or qualified synthetic data (QSD).

The semantic web for semiconductor and supply chain containing semiconductors bears the potential to enable the provision of those urgently needed QSD in volume, (integrated) complexity and accuracy needed. Quantum bit (qubit) based algorithm could provide the speed for the next and over-next generation for optimization and simulation in our domain.

AUTHOR BIOGRAPHIES

HANS EHM is Senior Principal Supply Chain of Infineon Technologies AG and there responsible for supply chain innovations. He holds degrees in Physics (Dipl. Ing (FH) HS Munich, Germany) and a Masters degree in Mechanical Engineering from Oregon State University/USA. In his almost 40 years of experience in the semiconductor industry, he was granted managing and consulting positions at wafer fabrication, assembly and test, and global supply chains. Hans was at the Supervisory Board of camLine Holding AG, an IT company providing software for supply and quality chains for over ten years until 2020. He was chairman of the European Leadership Team of the Supply Chain Council and is a past Board Member of APICS SCC. He leads the working group (Arbeitskreis) SCM of the ZVEI. He is active in several EU projects like SC³ – semantically connected semiconductor supply chains. Hans teaches Supply Chain Management at universities and initiates innovative academic curriculums. In 2015, he was awarded with the renowned LEO-Award (Logistics Excellence Optimisation) in the category “Manager” from DVZ Media Group. SCM Movement listed him as one of the 10 most influential SCM Managers in the DACH region in 2018. Hans played an initiating role for the MASM conference in initiating together with John Fowler the MIMAC studies in a US/EU collaboration in 1995. Together with John Fowler, Lars Mönch, and Chen Fu-Chien, he is one of the Dagstuhl seminar organizers on planning and control approaches for semiconductor supply chains.