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SEMICONDUCTOR MANUFACTURING IN TIMES OF GEOPOLITICAL TENSIONS: HOW MASM CAN HELP WITH MAKING SUPPLY CHAINS MORE RESILIENT

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ABSTRACT

This panel assembles a number of prominent representatives from industry and academia to discuss how semiconductor supply chains in times of increasing geopolitical risks can be made more resilient through Modeling and Analysis of Semiconductor Manufacturing (MASM) techniques and enabling software solutions.

1 MOTIVATION

Integrated Circuits (ICs) are essential components of all modern electronics products. For this reason the Semiconductor Manufacturing industry is a critically important segment of the global economy and any disruption to the semiconductor supply chain would have serious repercussions.

There are many possible disruptions that could affect global semiconductor supply chains. The underlying risks can be grouped into design risks, supply risks and demand risks. The biggest design risk constitutes attraction of talent to design the next generations of chips and run semiconductor fabrication plants (wafer fabs). Supply risks include the availability of raw wafers, processing equipment, materials, water, and power. Demand risks, i.e. unexpected changes in demand, either up or down, possibly amplified by the bullwhip effect, can cause major challenges for the semiconductor industry, and the recent chip shortage is a clear example of this. Pandemics, natural disasters such as an earthquake or typhoon, and geopolitical, even armed conflicts can cause any or all the above-mentioned disruptions. How can we plan for the unknown?

2 SEMICONDUCTOR SUPPY CHAIN RESILIENCE

In recent years supply chain disruptions have become more frequent and severe. Examples are the COVID-19 pandemic or geopolitical developments such as the recent US-China trade tensions. The associated delays result in productivity drops which impact not just the semiconductor industry but also many other industry sectors that rely on ICs for their products. It is therefore of utmost importance to enhance the resilience of semiconductor supply chains wherever possible.

This raises the question how this can be achieved, for example, through investing in advanced technologies for demand forecasting and risk management, diversifying sources of raw materials and production capabilities, or – as national resilience does not appear to be feasible – fostering stronger international collaborations, all this without jeopardizing the economic foundations of competition. By doing so, the industry will be better equipped to mitigate the impact of future disruptions, ensuring a steady supply of ICs to meet global demands. Resilience will not only benefit the semiconductor industry itself but also contribute to the stability of global economies, underscoring the critical role of the semiconductor industry in an increasingly digital world.

3 PANEL OBJECTIVE

This panel will discuss how techniques for Modeling and Analysis of Semiconductor Manufacturing (MASM) such as general data analytics, demand forecasting, simulation, optimization and Machine Learning can be extended and applied to enhance agility and reduce variability and other risks in semiconductor supply chains to mitigate the bullwhip effect and make supply chains more resilient. How can these risks be modeled given a lack of historical data on the specific impact to a supply chain? Can they be modeled quantitatively or just qualitatively? How can mitigation approaches to these risks be modeled as different resilience strategies are assessed?

Tools that process customer-supplier relationships through various data sources to identify tier-n suppliers and quantify those that are most ‘critical’ within the network, real-time data availability and visibility across national boundaries, flexible workflows, structured games/simulations of commercial and supply chain impacts under different risk scenarios, as well as modeling the unknown, among others, will also be topics to be addressed.

4 PANELISTS

The panel will comprise the following participants:

- Hans Ehm, Senior Principal Supply Chain Engineer, Infineon Technologies, Munich (Germany),
- John Fowler, Motorola Professor in International Management, W.P. Carey School of Business, Arizona State University, Tempe AZ (USA),
- Douglas Kent, Executive VP, Corporate and Strategic Alliances, Association of Supply Chain Management, Chicago IL (USA),
- Henry Marcil, Associate Partner, McKinsey & Company, San Francisco CA (USA),
- Simon J. E. Taylor, Professor of Computer Science, Brunel University London (UK).

The panel will be chaired and moderated by Peter Lendermann, Chief Business Development Officer, D-SIMLAB Technologies, Singapore.