Research Needs: Supply Chain AI Realized Future (SCARF)

Overview

This new research center will accelerate the development and implementation of Artificial Intelligence (AI) into the semiconductor manufacturing supply chain. While there are many proposed benefits, some of the key drivers are:

1. AI to address scale and complexity for a competitive advantage
2. Exploration of business value through the effective application of AI
3. Mitigation of supply chain risk to increase both agility and resilience

The research program members have determined mutual overlap and interest in the following narrowed research categories. We plan to develop further refinement in these areas and to apply company-specific use cases to enhance and highlight the importance of these research vectors.

Key research categories are:

1. Autonomous/Smart Planning & Logistics
2. Smart Manufacturing
3. Emerging Countries – Ecosystem Intelligence

This program focuses on research in a timeframe three to eight years ahead of technology release. Research on advanced tools and techniques such as modeling, simulation, and characterization can be of value with implementation timelines as low as one to two years post project completion. This timeframe represents the "sweet spot" for pre-competitive, collaborative research, after which the industry focuses on proprietary development for technology differentiation. Successful research proposals will need to match this timing.

Moving forward, the SRC is also embarking on an effort to broaden participation in its funded research programs. This aggressive agenda will help us drive meaningful change in advanced information and communication technologies that seem impossible today. In the programs we lead, we must increase the participation of women and under-represented minorities as well as strike a balance between U.S. citizens and those from other nations, creating an inclusive atmosphere that unlocks the talents inherent in all of us. Please visit https://www.src.org/about/broadening-participation/ for more information about the 2030 Broadening Pledge.

More details of each category can be found in the following sections, where the ordering is not intended to reflect the prioritization of a given research need.

Contributing Members include:			
Applied Materials	Chemonics	Intel	Semiconductor Research Corporation

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Semiconductor Research Corporation (SRC), Durham, NC 27703

Research Category 1: Autonomous/Smart Planning & Logistics

	SUB-TOPIC: AUTONOMOUS/SMART PLANNING
1.1	AI-enabled Smart Planning to align/shape demand up and down the value chain (i.e., up-the-chain supply/demand alignment with Tier 1 suppliers and down-the-chain with customers)
1.2	Augment/incorporate external and non-traditional demand signals to improve accuracy
1.3	Comprehending demand volatility and anticipating capacity-limiting commodities/products
1.4	Understanding and incorporating actual usage and other demand signals into planning
	SUB-TOPIC: SMART LOGISTICS
1.5	Augment routine logistics (e.g., 3PL) with real time (or nearly so) external and non-traditional external signals, information, and early-warning capabilities
1.6	Increasing visibility and transparency, while simultaneously decreasing uncertainty and unforeseen risk
1.7	Shipping and logistics are a function of suppliers' locations and locations change
1.8	Improving trust and traceability (e.g., enabled by distributed ledger, verifiable authenticity)
1.9	Applying smart logistics to decrease inventory (stocking, risk, locate adjacent to point of use)

Research Category 2: Smart Manufacturing

	SUB-TOPIC: INDUSTRY 4.0 FOR SUPPLY CHAIN
2.1	Industry 4.0 data/equipment applications and integration, advanced visualization
2.2	Equipment signals, Tool/Status and Performance, Predictive maintenance
2.3	Actionable Intelligence (e.g., a supply chain supporting predictive maintenance)
2.4	Implications of a 'Smart Factory': AI-enabled advancements for manufacturing methods
	SUB-TOPIC: RELATED SUPPLY CHAIN APPLICATIONS
2.5	Vendor managed inventory (incl change management, EOL)
2.6	Applying AI methods and 'Actionable Intelligence' to decrease variability and improve yield
2.7	Protecting and securing intellectual property (IP)

Research Category 3: Emerging Countries – Ecosystem Intelligence

	SUB-TOPIC: PLANNING, SOURCING & LOGISTICS
3.1	Understanding/developing/applying world-class supply chain practices to emerging and lower-cost geographic regions (specifically, India and Africa): • Lessons derived for the pharmaceutical industry (for world-wide delivery, last mile) • Lessons derived for the high-tech industry (electronic manufacturing sourcing, manufacturing)
3.2	Equipment sign Strategic Focus: Applying AI to assess emerging strategic technology partnerships, joint developments, and sourcing/logistical opportunities