Semiconductor Research Corporation

MMI Informational Webinar

Workforce Development and Sustainability

April 13, 2023

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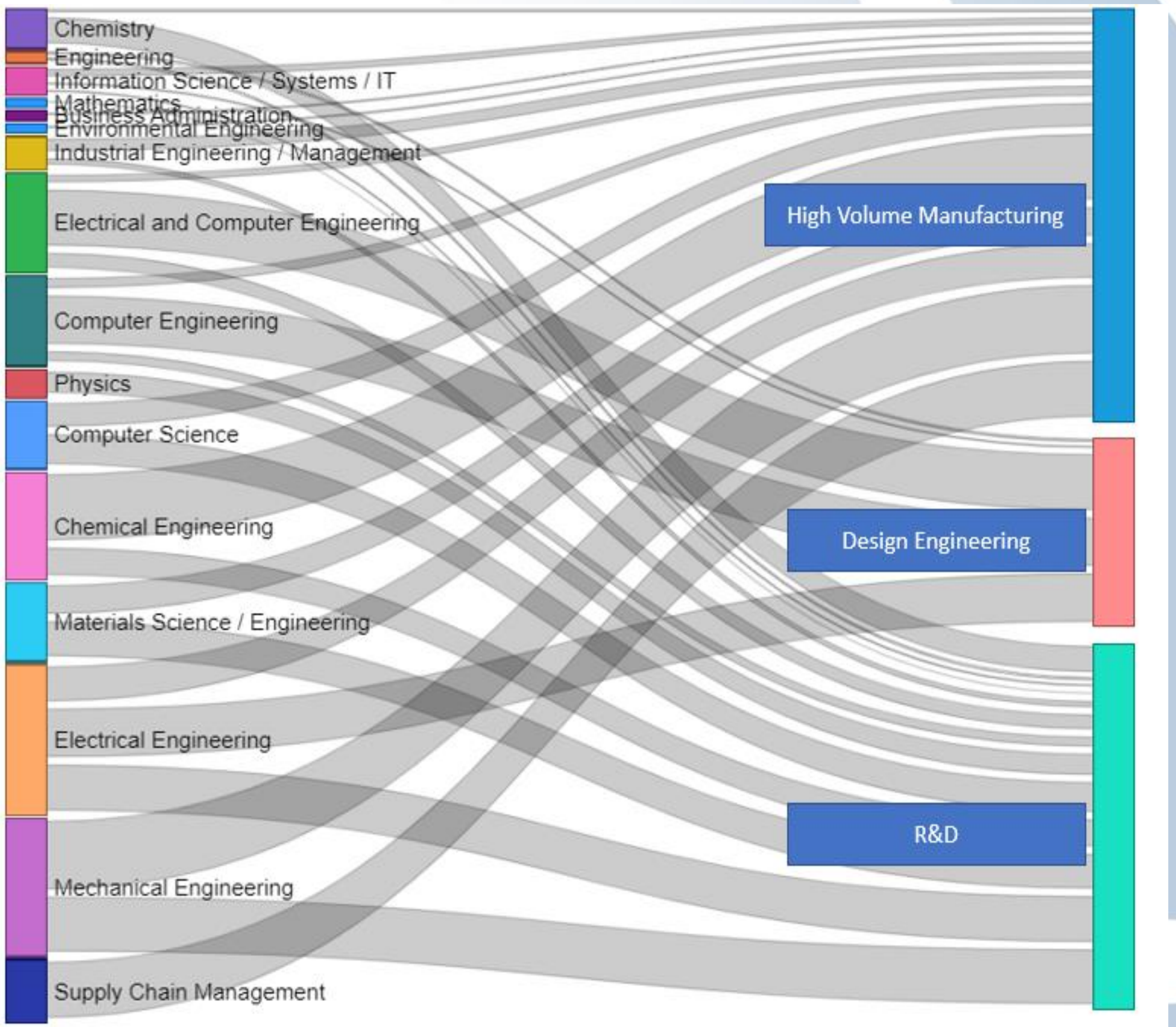
CHIPS R&D Vision:

- US Technology Leadership
- Accelerate Ideas to Market
- Develop Talent

Sample of Majors (BS/MS/PhD) Needed for Technology and Manufacturing Leadership

Multi-disciplinary - Team-based
Problem solving – Critical thinking
Technical Depth

Discovery and Innovation



Developing the Talent Pipeline in the US

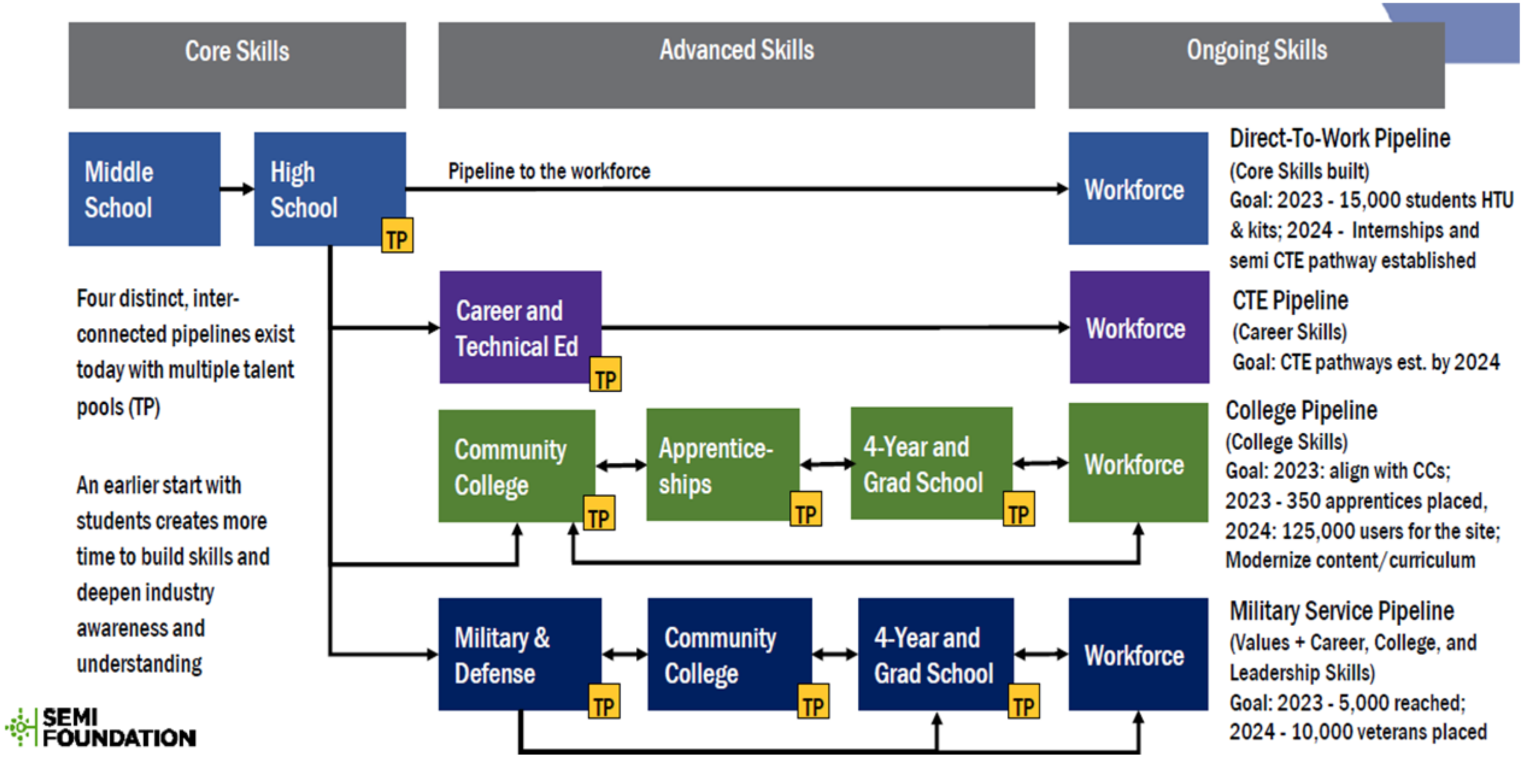
National Call to Action

Determine what is needed
Provide jobs/opportunities

Figure out what works:
- win hearts and minds
- provide support/resources
- quantify success
- improve

Key: SCALING and SPEED

WFD Path – Excitement to Engagement – the "hook" through career



- "The Hook"
- Awareness
- ***Beyond STEM***
- Wow Factor
- Exposure
- Experience

- ***"Change the World" Impact***
- Experience, Internship, Mentorship
- Research Experience
- Continued Awareness
  - Incl. non EE students

- Engagement
- Reward /Challenge
- Career Advancement

https://srcmapt.org

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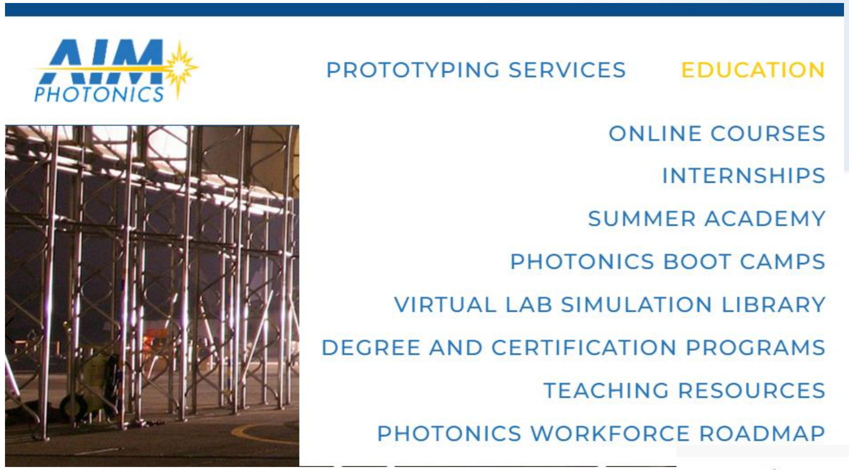
Manufacturing Institutes & Talent Development

1. Manufacturing Institutes do not manufacture. They are created to:
   - Restore manufacturing jobs in the U.S.
   - Use the vast resources in academia to research industry-relevant tech using shared infrastructure
   - "Overcome technical hurdles, share state-of-the-art facilities, and train tomorrow's workforce"*



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Advancing Silicon Carbide and Gallium Nitride technologies.

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* https://www.manufacturingusa.com/
# GAO analysis of data provided by Manufacturing USA Institutes, GAO-22-103979

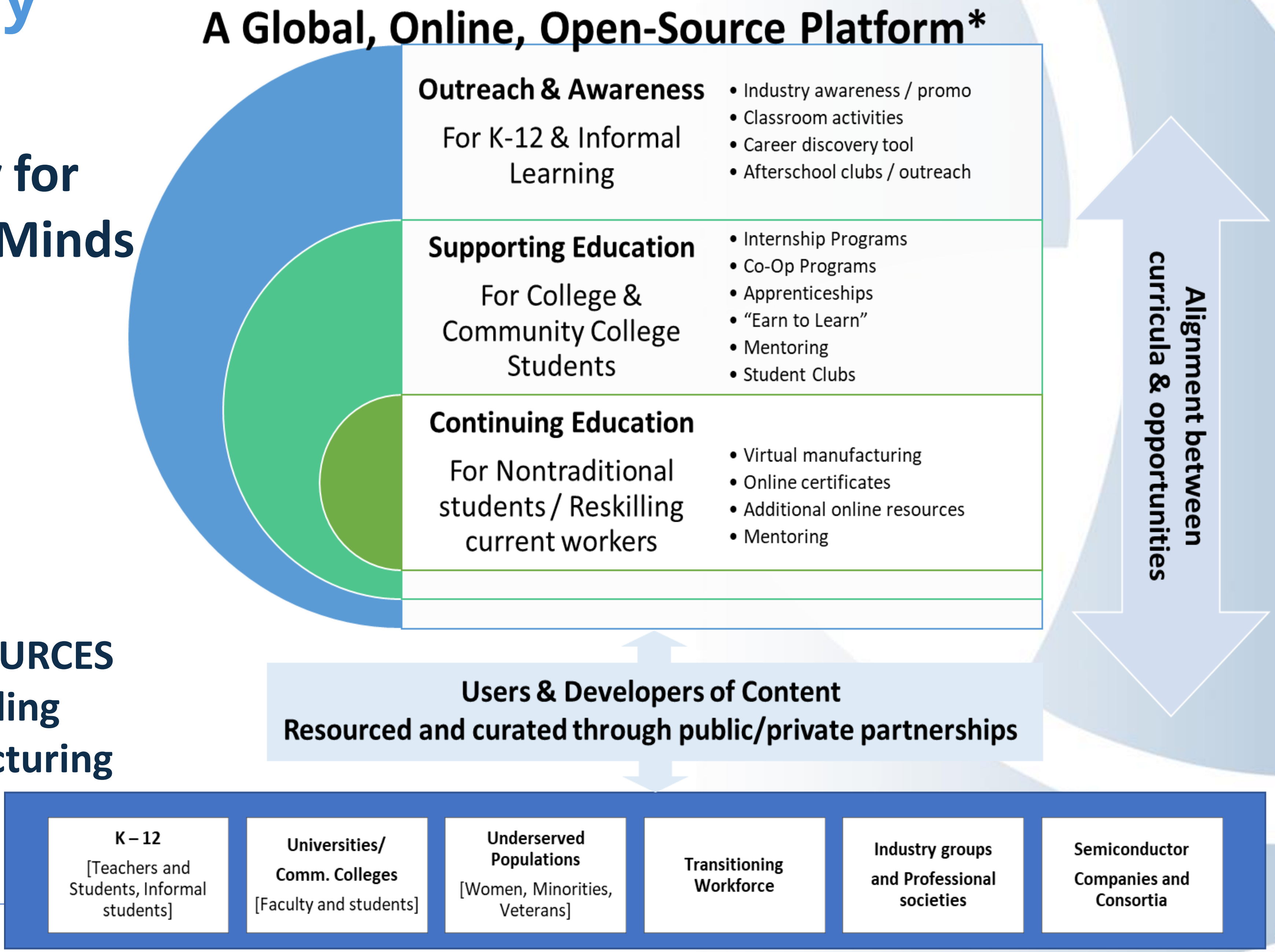
Work Nationally Grow Locally

National Community for Winning Hearts and Minds

- AWARENESS
- UNDERSTANDING
- RELEVANCE

- Wrap-around Services

- Needs Substantial RESOURCES BEYOND CHIPS Act Funding
- Unique Role of Manufacturing Institutes



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Chapter 2
Sustainability and Energy Efficiency

2.1. Introduction

Semiconductor devices are a key enabler to bring efficiency to critical system level economic processes. As an example, digitalization enabled by the combination of edge devices, communications technology, and data centers enables important capabilities such as e-commerce, tele-health, online education, streaming, and remote working. In addition, digital technologies, which are enabled by semiconductor devices, have the opportunity to provide new insight and accelerate progress towards environmental goals and have the potential to offer solutions to monitor, mitigate and adapt to the impacts of climate change. Looking forward with concepts such as Industry 4.0, many industries are relying on electronics to provide sustainable solutions for their markets. As an example, electronics are necessary for the sustainability driven $7.8 billion agricultural robotics market [1,2] or for the sustainability driven $31.8 billion smart grid technology market [3].

Thus, while semiconductor devices can help enable powerful solutions to global, regional, and local sustainability challenges, the potential environmental impact associated with the manufacture, use, and end of life management of semiconductor devices must also be considered. As described here, the key to success for microelectronics and applied packaging technologies (MAPT) - moving forward - is to continue to develop new and beneficial technologies while simultaneously ensuring that environmental considerations are an integral part of the product design and development phase.

To this end, the Semiconductor Research Corporation (SRC) has long since recognized the importance of incorporating environmental considerations into the design and development of semiconductor devices and has been supporting environment, safety and health (ESH) research for over 20 years. As a consortium of industrial leaders in semiconductor research, SRC is uniquely positioned to help reduce the environmental impact of semiconductor devices by driving research that helps identify safer, more efficient and more effective materials; improve processes and systems to reduce energy and material use and minimize waste generation; and develop treatment and abatement technologies for effluent, emission, and waste management. In addition, SRC's 2030 Decadal Plan for Semiconductors, Seismic Shift #5, highlights the need for new computing paradigms and architectures with radically improved energy efficiencies to meet the increasing demand for information and communication technologies (ICT), which we will herein refer to as 'compute.

This chapter addresses the need for i) dramatic increases in energy efficiency for computing and ii) increased environmental sustainability and efficiency across the entire life cycle of a semiconductor devices while simultaneously meeting performance criteria.

- Energy Efficiency
  - Energy Efficiency of Computing and Communications
  - Energy Efficiency of Power Electronics
- Environmental Sustainability: Product design, development, manufacturing and end-of-life management
  - Factory operation and tool design
  - Product design & development
  - Wafer fabrication
    - Material selection
    - Photolithography
    - Etching Gases / Chamber Cleans / Chemical Deposition
    - Chemical mechanical planarization
    - Heat transfer fluids
  - Back end assembly, test & packaging operations
  - Chemical waste & aqueous effluent
  - End of life management
- System level sustainability challenges
- ***Work force development***

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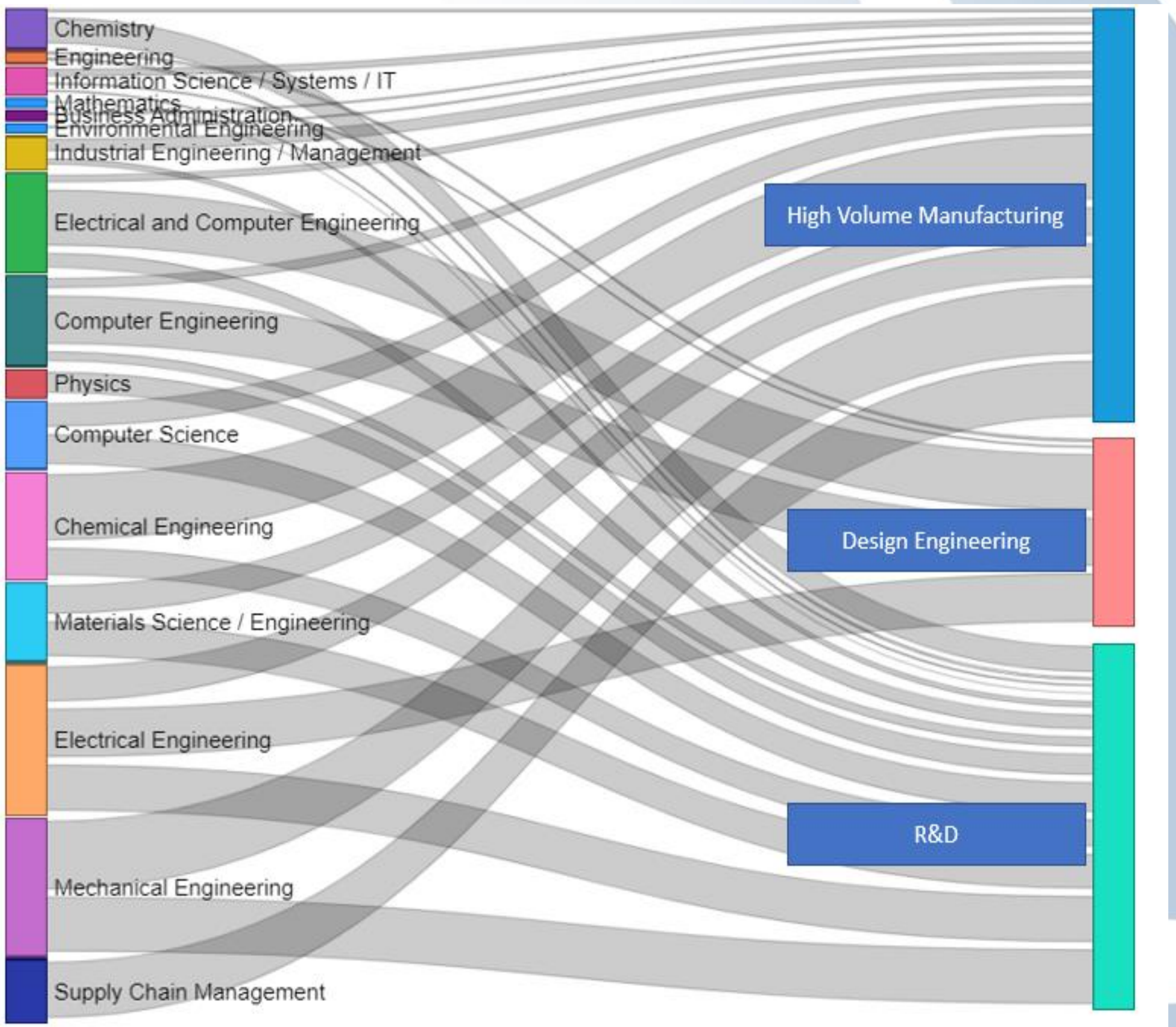

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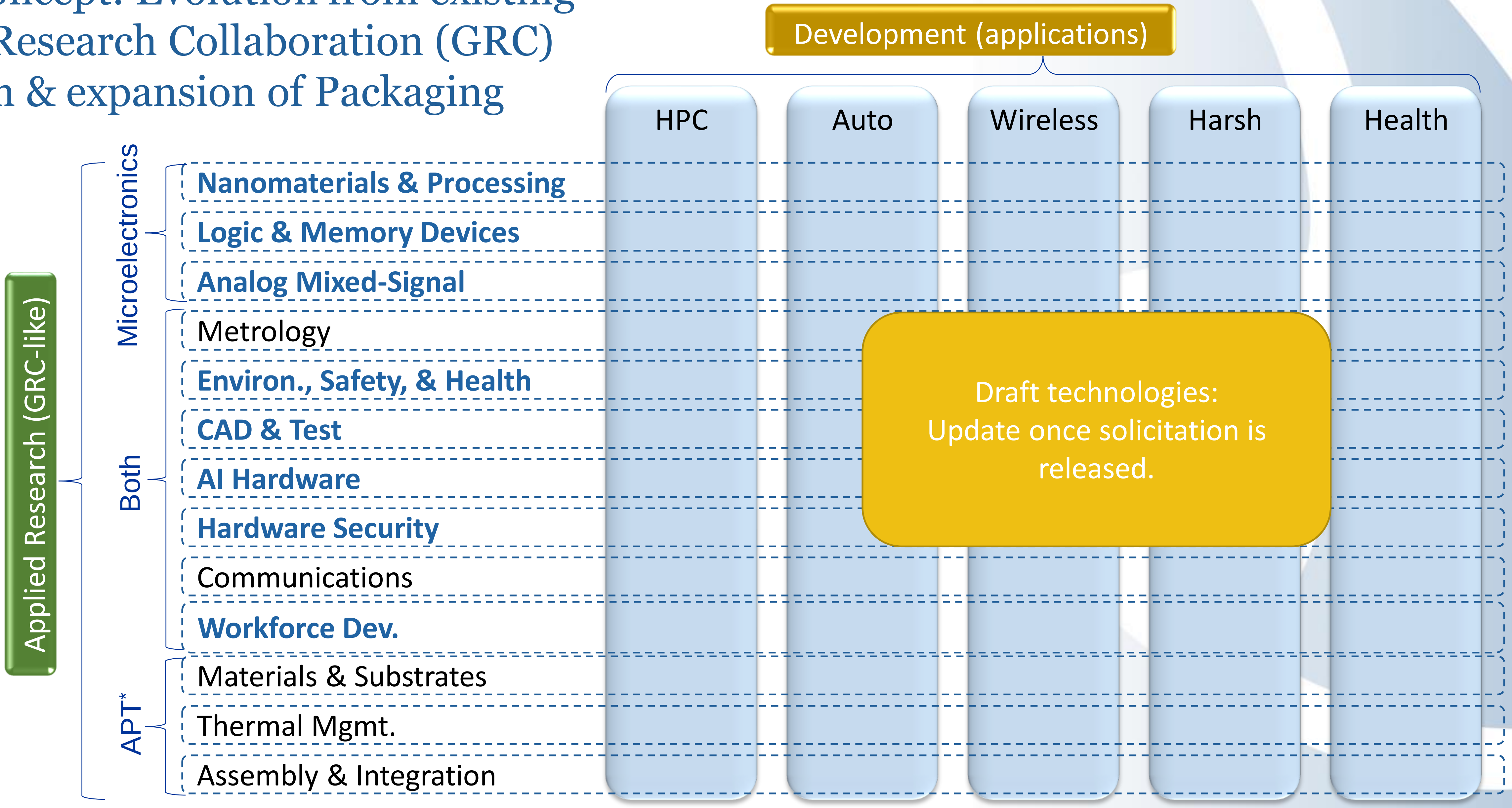
More info: handwerker@purdue.edu

MMI Concept: Evolution from existing Global Research Collaboration (GRC) program & expansion of Packaging



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* Advanced Packaging Technology

https://www.src.org/about/public-documents/src_rfi_response_to_nist_2022.pdf