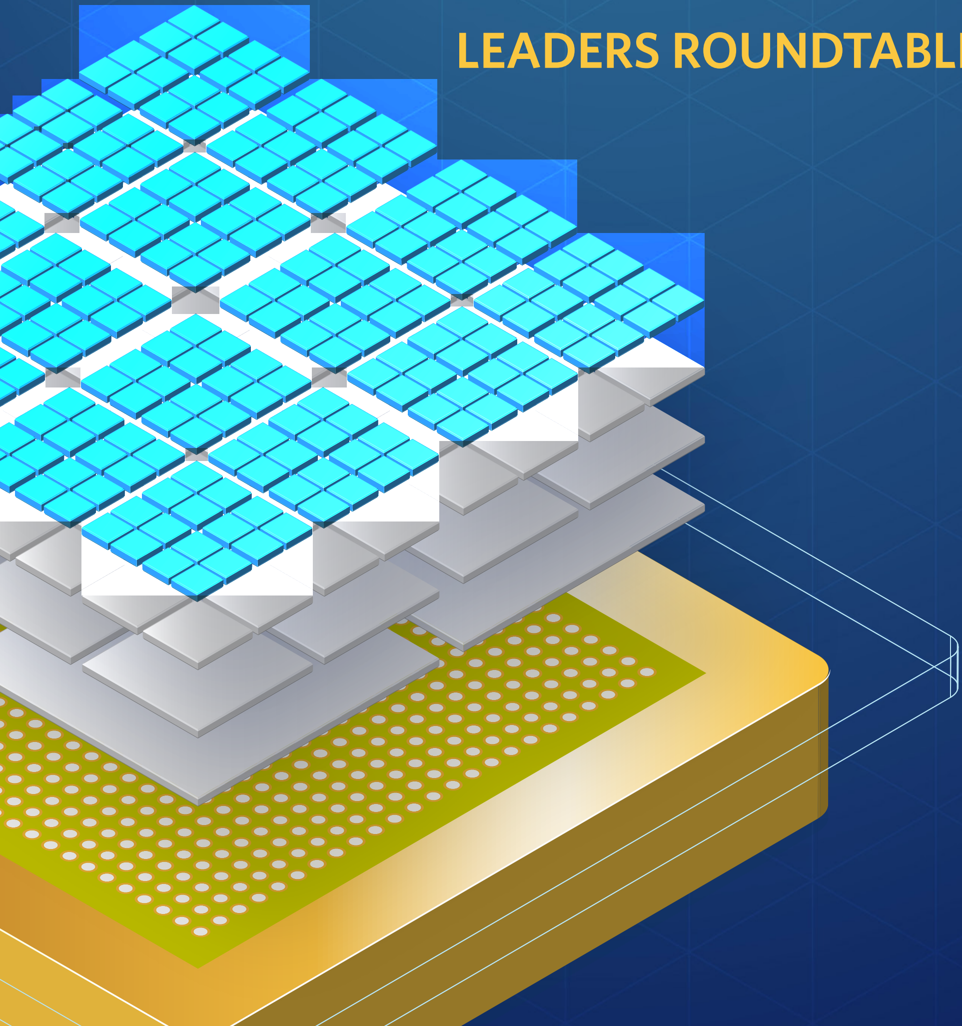
2025

LEADERSHIP SUMMIT FOR ADVANCED PACKAGING

LEADERS ROUNDTABLE REPORT



APPLIED MATERIALS™

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THANK YOU

Dear Valued Partner,

I was delighted to host our second Leadership Summit for Advanced Packaging on October 10, 2025, in Phoenix, Arizona. Over the course of the roundtable, you and your fellow industry leaders shared a wealth of insight – most of which we have captured in this report. These perspectives will prove extremely valuable as we tackle our industry's challenges and opportunities moving forward.

This year's summit focused on Collaboration Across Boundaries and Workforce Development, and we had participants from every corner of the semiconductor ecosystem take part. One message was clear: tackling our most pressing challenges demands bold, cross-disciplinary collaboration–no single organization can go it alone. We need to reinvent how we innovate by working together in new ways if we want to accelerate progress. In that spirit, the ideas exchanged during this discussion are already shaping the next chapter of our EPIC Advanced Packaging initiative, informing how we build multi-party alliances and nurture the talent that will drive these collaborations forward.

At the same time, the summit underscored an equally critical priority: developing our future workforce. A highlight of the event was hearing from a Young Workforce Panel – a group of up-and-coming engineers and students who told us candidly what they value. Their message was inspiring: they are looking for challenging, meaningful careers with plenty of opportunities to keep learning. To attract and retain these bright minds, we must strengthen partnerships with universities, invest in more hands-on training programs, and foster an inclusive culture that emphasizes mentorship and growth.

Before closing, I want to express my heartfelt gratitude for your participation. I want to extend a special thank you to Dan Hutcheson for facilitating these discussions. The energy, ideas, and enthusiasm that filled the room were inspiring, and I left the summit excited about the road ahead. It underscored that we have a community that deeply cares about the future of advanced packaging.

Thank you again for contributing your time, expertise, and passion. I look forward to another illuminating dialogue at our 2026 Leadership Summit for Advanced Packaging, taking place in Singapore, this coming December. Together, we are shaping the future of the semiconductor industry – through innovation, partnership, and a steadfast commitment to developing the talented people who will drive our next era of growth.

Until next time,

KEVIN MORAES
VP, Marketing & Business Development
Applied Materials

ROUNDTABLE ATTENDEES

Sung Jin Kim
Chief Technology Officer
Absolics

Douglas Dale Lefever
Representative Director,
Group CEO
Advantest Corporation

Babak Sabi
Vice President of Technology
Amazon

Liwei Wang
Senior Director of
Heterogenous Integration
Foundry Technology
Development
AMD

Doug Scott
Corporate Vice President,
Advanced Packaging
Business Unit
Amkor Technology

Chris Bailey
Professor & Director of
the Centre for Advanced
Semiconductor Packaging
Arizona State University

Chris Scanlan
Senior Vice President of
Technology
Besi

Bryan Black
Chairman, Board of Directors
Chipletz

Johnny Cham
Vice President, Operations
GlobalFoundries

Rahul Manepalli
Vice President, Director of
Substrate & Wafer Assembly
Tech Development
Intel

Hamid Azimi
Senior Vice President of
Advanced Packaging and
Foundry
Marvell

Glenn Daves
Senior Vice President of
Package Innovation
NXP Semiconductors

Rama Shukla
Vice President of Technology
Strategy
SanDisk Corp.

Jaesik Lee
Vice President of Package
Engineering
SK Hynix

G. Dan Hutcheson
Vice Chair and Senior Fellow
TechInsights Inc.

SV Sreenivasan
Founder and Chief Technology Officer
Texas Institute of Electronics

Dwayne Labrake
Chief Executive Officer
Texas Institute of Electronics

William F. Mackenzie
Group Managing Executive Officer
Ushio

Shuo-Che Chang
Technology Executive
Winbond Electronics

Prabu Raja
President, SPG
Applied Materials

Satheesh Kuppurao
Group Vice President, SPG
Applied Materials

Vincent DiCaprio
Vice President, Business Development
Applied Materials

Manish Ranjan
Managing Director, Business Management
Applied Materials

Deenesh Padhi
Vice President, Engineering
Applied Materials

Kevin Moraes
Vice President, Marketing & Business Development
Applied Materials

Balaji Chandrasekaran
Vice President, Marketing & Business Development
Applied Materials

Arun Karamcheti
Senior Director, Product Marketing
Applied Materials

Young Workforce Panelists

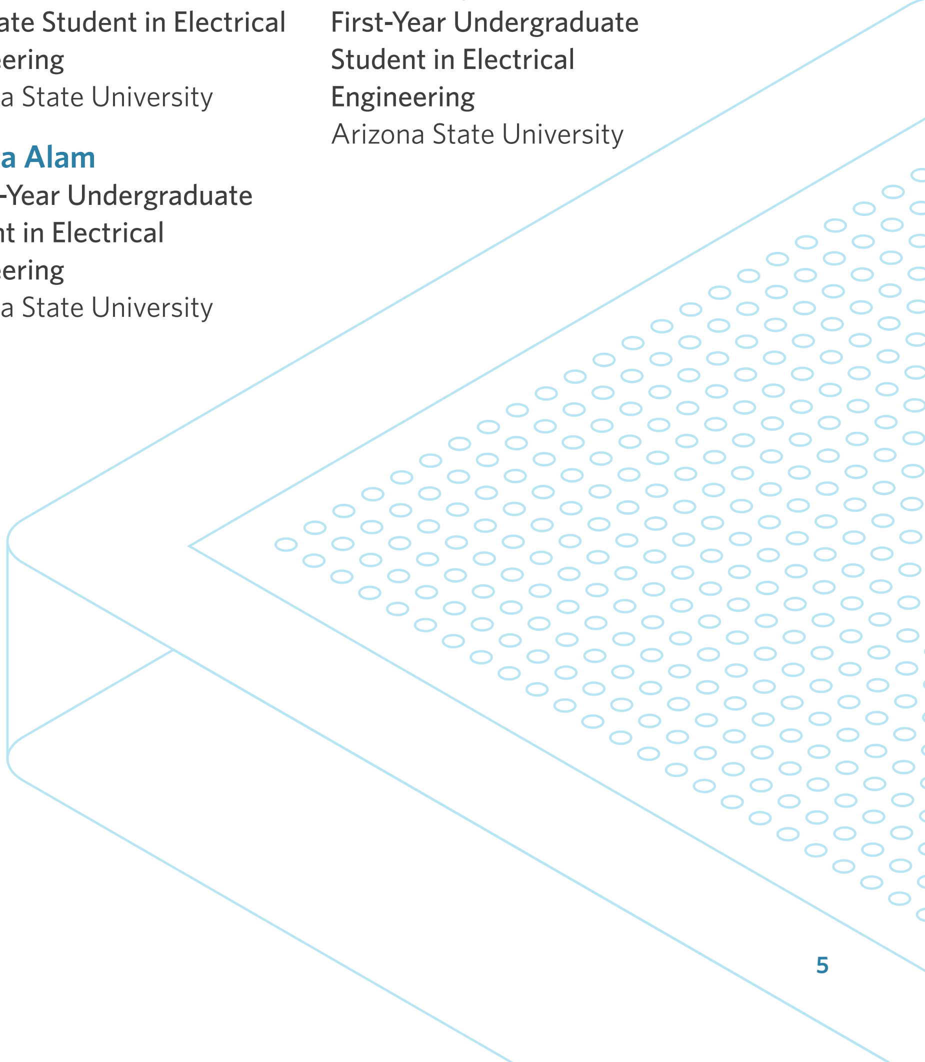
Morris Lee
Process Support Engineer
Applied Materials

Ethan Swonger
Ph.D. Candidate in Materials Science
Arizona State University

Anna Bethke
Graduate Student in Electrical Engineering
Arizona State University

Nabiha Alam
Senior-Year Undergraduate Student in Electrical Engineering
Arizona State University

Evie Henry
First-Year Undergraduate Student in Electrical Engineering
Arizona State University



COLLABORATION ACROSS BOUNDARIES

G. Dan Hutcheson, Vice Chair of TechInsights Inc., opened the discussion by emphasizing the critical importance of collaboration across boundaries.

Introduction

Dan Hutcheson, Vice Chair and Senior Fellow at TechInsights Inc., opened the discussion by emphasizing the critical importance of collaboration across boundaries in the semiconductor industry. At this year's Leaders Roundtable, experts representing device makers, foundries, OSATs, equipment suppliers, academia, and startups explored how innovative partnerships can fuel the next wave of progress.

To spark a meaningful discussion, Dan posed a set of forward-looking questions focused on the future of collaboration in advanced packaging:

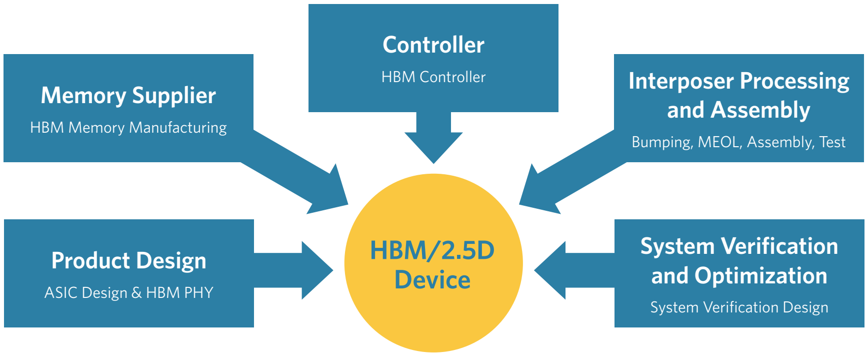
- **New Partnership Models:** How can we unite diverse stakeholders—design houses, OSATs, foundries, and material suppliers under innovative collaboration frameworks?
- **Intellectual Property Sharing:** What mechanisms enable secure and fair IP sharing in a multi-vendor ecosystem?
- **Business Models & Funding:** Which structures equitably distribute costs, risks, and rewards across the value chain?
- **Ecosystem Standards:** How can common standards accelerate technology adoption and interoperability?
- **Geopolitical Dynamics:** What strategies mitigate cross-border challenges while fostering global cooperation?

Industry leaders then shared their perspectives on the future of collaboration, often emphasizing the urgency of breaking down silos and the need for cross-boundary partnerships to drive innovation in advanced packaging.

Evolving Partnerships Across the Semiconductor Ecosystem

Collaborative partnerships are now essential. A resounding theme was that collaboration must occur vertically as well as horizontally. Multiple attendees noted that true cross-boundary collaboration means linking every layer of the value chain, from materials and equipment through chip fabrication, packaging, and design, all the way to system integration. Traditional one-to-one partnerships are no longer sufficient; multi-party alliances are needed to share expertise and align development roadmaps.

New business models are emerging to share risk and investment. One participant noted a $7B U.S. OSAT facility was possible only through **strategic partnerships** across the supply chain. Participants echoed this, citing **co-development** with customers and equipment providers from the earliest design stages. Examples like high-bandwidth memory (HBM) show why deep collaboration matters: memory vendors, logic designers, and foundries must co-optimize interfaces, thermal management, and packaging. Customization is rising but scaling it without straining resources will require **broader ecosystem solutions**.



Delivering HBM solutions demands a multi-player ecosystem spanning design, assembly, and verification (Source: Adapted from *High Bandwidth Memory White Paper - AnySilicon*)

Shared Vision & Roadmaps

Transparency and roadmap alignment across fabless firms, startups, and suppliers are critical. In the past, companies guarded their roadmaps, but now there is growing recognition that sharing future requirements even with competitors present under consortium settings benefits everyone. The group agreed that more **open communication of needs and technical challenges** in a pre-competitive space allows the supply chain to anticipate and invest in solutions earlier. This might occur through industry consortia or working groups. For instance, leaders from a foundry and an OSAT described their recent joint effort to coordinate tool procurement and capacity expansion, enabled by jointly securing commitments from end-users for future high-volume packaging orders. Such **multi-party roadmap alignment** ensures high utilization and ROI for new facilities and tools, making ambitious projects feasible where they wouldn't be for one company alone.

Risk & Reward Sharing

Collaboration only succeeds when costs, risks, and rewards are shared equitably. Participants acknowledged that one of the biggest barriers is the fear of losing competitive advantage or profit share, especially in advanced packaging where margins are thin and investments are hard to justify without guaranteed returns. The discussion highlighted solutions such as **co-investment models** through public-private partnerships, government incentives, and contractual agreements that ensure all parties benefit when a joint technology succeeds. Examples like IMEC and SRC's pre-competitive research programs show how pooling funds and agreeing on IP ownership, licensing, and revenue splits upfront builds trust and encourages companies to contribute their unique expertise. Ultimately, **benefit sharing** is as critical as cost sharing, and early alignment on these terms is the foundation for meaningful collaboration.

Standardization vs. Customization

The group also explored the role of industry standards in enabling collaboration. While common standards—such as UCIe for chiplet interconnects can unlock a "lego-like" approach and broaden partnerships, progress has been slow. Major players often resist standardization to protect differentiation, and rapid technology cycles risk making standards obsolete before they gain traction. Panelists agreed that standards should focus on key areas like design interfaces, material data formats, and reliability test vehicles, and be **driven by open-industry consortia** such as SEMI and IEEE rather than individual companies. Importantly, standards must involve all stakeholders, including equipment and EDA vendors, to ensure practicality. The consensus was clear: standards should provide a **common foundation** while leaving room for customization and proprietary innovation, striking a balance between unity and flexibility.

> If you don't know what your customer's customer is planning, you can't develop the right lithography tool or materials in time.
>
> **BRYAN BLACK**
> Chairman, Board of Directors, Chipletz

The Role of Government and Industry Consortia

The discussion explored whether government or neutral entities should help foster collaboration. Historical examples like SEMATECH in the 1980s–90s and recent CHIPS Act programs show that public initiatives can bring competitors together by funding shared infrastructure or incentivizing cooperation. While participants agreed that government support is valuable, especially for workforce programs and consortia research, they cautioned against direct regulatory enforcement of technical standards in such a fast-moving field. A more effective role is creating **neutral platforms**, such as open innovation centers or university-affiliated institutes like the Texas Institute of Electronics, where companies can work on pre-competitive projects without fear of losing their edge. These neutral grounds can also address gaps like the lack of industry-standard test chips and methods for complex 3D packages. As one leader noted, *"Every company has its own, which isn't affordable for smaller players."* Developing **common reference designs** for reliability and yield benchmarking would benefit the entire ecosystem, and consortia with public backing could deliver these shared resources.

Interdisciplinary Collaboration: Breaking Down Silos

Solving next-generation challenges requires both **cross-company and cross-disciplinary collaboration**. Advanced packaging is inherently multidisciplinary, and the industry must convey this to future engineers. A key intersection is industry–academia: universities advance the science behind complex interfaces and materials, forming the foundation for innovation. Strengthening these links through "hub and spoke" models—where consortia unite EDA tool makers, designers, packaging houses, materials suppliers, and systems companies in a pre-competitive environment is essential. Data sharing and co-optimization are also priorities. Design, manufacturing, and test teams must collaborate early, with test engineers involved in chiplet interface and package architecture design. As one participant noted: *"You can put any package together you want, but if you can't test it, it's never going to come to market."* Building interdisciplinary skills and teams is as critical as partnering across firms. No one entity can do this alone—it takes the entire ecosystem working together.

> "Success comes from the ability to partner broadly while maintaining deep expertise in some areas and a broad understanding of how your work impacts others. You've got the silicon, the package, and the test—and you need to understand all three to succeed.
>
> **GLENN DAVES**
> Senior Vice President of Package Innovation
> NXP Semiconductors

WORKFORCE DEVELOPMENT

The second discussion on Workforce development kicked off with an engaging Young Workforce Panel, offering authentic insights from the next generation of talent.

Introduction

Advanced packaging is a relatively young and rapidly evolving field, and its growth is creating an urgent demand for talent. The topic was introduced with some striking projections: over the next several years, the industry faces a potential talent shortfall of thousands of workers if we continue with "business as usual" hiring and training practices.

The session featured a Young Workforce Panel sharing first-hand perspectives, followed by a discussion where leaders reflected on these insights and emphasized closing skill gaps and strengthening academia–industry ties.

1 Million

additional skilled workers needed by 2030[1]

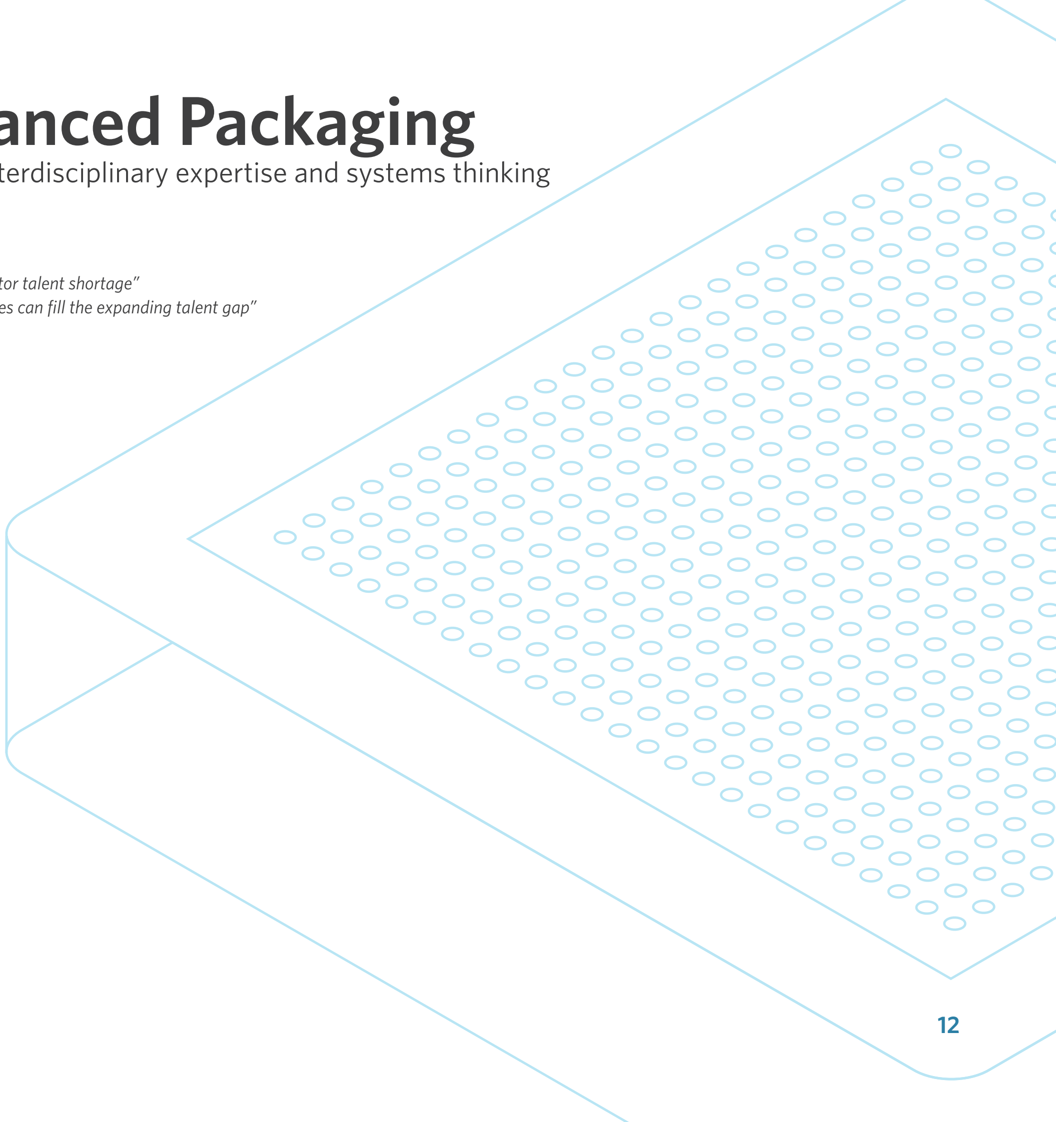
17%

of semiconductor technical workers are women[2]

Advanced Packaging

requires interdisciplinary expertise and systems thinking

[1] Source: Deloitte report *"The global semiconductor talent shortage"*
[2] McKinsey report *"How semiconductor companies can fill the expanding talent gap"*



This intergenerational dialogue was extremely illuminating. Seasoned industry leaders were able to hear first-hand what the next generation values and expects, and where they see hurdles or attractions in our sector. The feedback was candid and revealing:

- **Educators as catalysts:** Passionate teachers and early exposure to STEM subjects, especially through hands-on labs, played a pivotal role in guiding students toward semiconductors. Flexibility in academic pathways enabled students to discover the field through diverse entry points. As a young panelist mentioned, "Be passionate and have a clear idea in mind of what you want to impart to the student. So, if you want the student to be passionate about your industry, you should be able to deliver that message."
- **Gen Z's Career Values:** Panelists expressed a strong preference for dynamic, purpose-driven work over routine or repetitive roles. They are willing to embrace long hours and unpredictable schedules if the work is meaningful. Flexibility, autonomy, and continuous learning were identified as core values for the emerging workforce.
- **Hardware Rebound:** Interest in hardware is resurging, driven by global events and national policy. Students viewed hardware as foundational and enduring, while recognizing software's essential role in modeling and innovation. Both must be integrated in education.
- **Practical Curriculum and Industry-Aligned Training:** Panelists strongly advocated for practical, industry-tailored coursework that bridges the gap between academic theory and real-world application. Courses developed in collaboration with industry were seen as highly valuable, especially when paired with internships and lab-based learning.
- **Inclusive Talent Pipelines:** Most panelists did not come from families with semiconductor backgrounds. Despite this, their families played a crucial role in instilling discipline and supporting STEM interests. This highlights the importance of inclusive outreach strategies and focuses on cultivating interest through accessible, engaging experiences.

> “Having hands-on experience, whether in a research lab or through fabrication courses, was critical for me. You learn the theory in class, but you don't really understand how it all comes together until you see the process in action. That's what sparked my interest in semiconductor manufacturing.
>
> **ANNA BETHKE**
> Electrical Engineering Graduate Student, ASU

Next, the spotlight shifted to industry leaders to reflect on the perspectives shared by the next generation and explore what they mean for our workforce's future.

To guide the conversation, Dan posed a series of thought-provoking questions aimed at addressing the future of workforce development in semiconductors. These questions focused on how to:

- **Inspiring Talent:** How do we make semiconductor careers exciting and visible for students and underrepresented groups?
- **Academia-Industry Partnerships:** How can we better align curricula with industry needs through stronger academic and corporate collaboration?
- **Workforce Gaps:** Where are the critical skill gaps—and how can apprenticeships, bootcamps, and vocational programs help fill them?
- **Career Pathways:** How can companies redesign career paths to boost retention and offer flexibility?

Talent Gap is Real and Growing

Roundtable members began by acknowledging a looming workforce gap. As one participant noted, industry forecasts show a *"huge shortage of skilled workers versus what's needed"* in advanced packaging over the coming decade. Advanced packaging often requires specialized expertise that historically has been learned on the job rather than through formal education – meaning new graduates may not be fully prepared for these roles. Dwayne Labrake emphasized, *"Advanced packaging is very multidisciplinary and it's a system-level approach that needs to be taken. Engineers need to understand other disciplines while remaining deeply skilled in their own fundamentals."* Participants highlighted that **developing talent systematically** from the ground up is now crucial. It was noted that many current leaders stumbled into packaging from other fields (physics, chemistry, etc.) because dedicated programs were rare in their time. To meet future needs, the industry must **partner with academia** to create intentional pathways – from revamped curricula to internships and co-op programs focusing on heterogeneous integration, packaging design, reliability, and related skills.

Broadening the Talent Pipeline

Leaders agreed on widening the recruitment lens to attract diverse talent beyond traditional sources like a few top universities or dominant regions. There's a vast untapped pool in other schools, regions, and demographics. Companies are hiring from **interdisciplinary backgrounds** and training them in packaging, while stressing early outreach—introducing microelectronics at undergrad or even high school level. Suggested tactics included sponsored research, campus competitions, and social media campaigns. Academia noted enrollment rises when students see exciting careers ahead, so the industry must showcase advanced packaging as "where the action is."

Workplace Culture and Expectations

The dialogue also touched on how the working environment can be made more welcoming to new entrants. The student panelists were frank that some traditional corporate cultures feel too hierarchical or inflexible for them. They value open communication, mentorship, and work-life balance. Roundtable members discussed the need to adapt certain practices: for example, providing flexible schedules or hybrid work options where feasible, and fostering a more inclusive culture on the manufacturing floor. It was also noted that **recognition and feedback** are highly motivating for young professionals who are used to continuous feedback in educational settings. Companies were encouraged to celebrate contributions publicly and provide structured feedback and coaching.

Education and Training Programs

Industry and academia participants agreed education must evolve to meet workforce needs. Universities are adding courses on advanced packaging, heterogeneous integration, and reliability—often with industry partners and expanding programs into specialized degrees or certificates. Examples like SEMI's university initiatives and regional apprenticeships were cited. Companies were urged to invest in **on-the-job training** through new-hire rotations, internal bootcamps, and continuous learning. **Joint industry–academic training centers** were suggested as hubs for hands-on experience with state-of-the-art tools. Young panelists also called for greater visibility of semiconductor careers on social media and in popular culture.

Retention and Career Growth

Attracting talent is only half the battle—retention matters just as much. High turnover happens when early-career professionals feel stuck or overlooked. Clear technical career paths, **mentorship**, and strong communities keep people engaged. Timely recognition—promotions, awards, and visibility also counts. While passion drives Gen Z, competitive pay, scholarships, and incentives tip the scales against big tech rivals. The industry must highlight its unique value: **building tangible products, shaping future tech, and offering stability with growth**. Workforce development is a shared responsibility across industry, academia, and government. By aligning talent strategies with these priorities, the semiconductor sector can create a sustainable pipeline of skilled professionals ready to power the next wave of innovation.

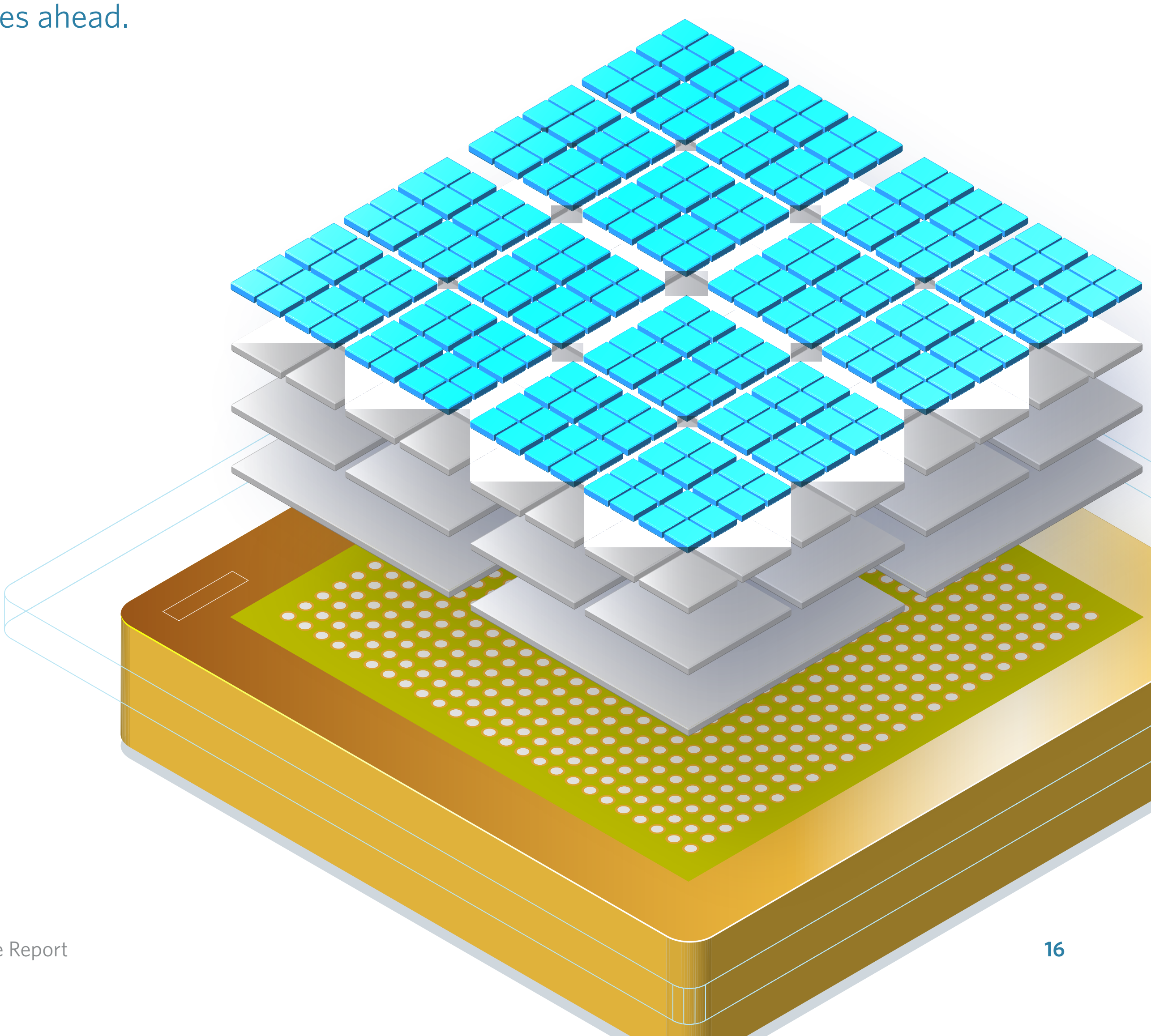
> “Closing the academia–industry gap is critical to prepare students for AI and system integration. AMD's early engagement—bringing undergrads in through internships has proven invaluable, giving students real-world challenges and focus. Today's discussion reinforced the need for deeper campus partnerships and end-to-end system exposure. Collaboration between universities and industry is essential.
>
> **LIWEI WANG**
> Senior Director of Heterogenous Integration,
> Foundry Technology Development, AMD

CONCLUSION

The 2025 Leadership Summit proved that progress in advanced packaging begins with connection. By bringing together visionaries from across the semiconductor ecosystem, we broke down silos and sparked partnerships that transcend traditional boundaries. These conversations weren't just about technology, they were about trust, transparency, and a shared commitment to shaping the future together.

This summit is more than an event; it's a catalyst. It empowers participants to align roadmaps, share risks and rewards, and build the talent pipeline that will sustain innovation for decades. When leaders unite, ideas turn into action and action into advantage. Together, we are not just strengthening ties; we are forging the collaborative fabric that will define the next era of semiconductor growth.

The commitment demonstrated by all participants reflects the industry's resolve to advance toward a more integrated, sustainable, and innovative future. In 2026, we look forward to translating these discussions into concrete steps that strengthen partnerships and empower the workforce to meet the challenges ahead.



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