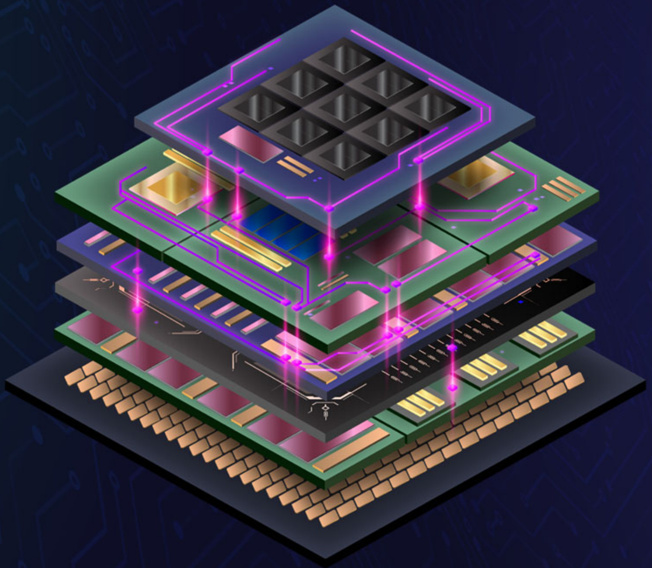
NGMM Economics and Sustainability

Mina Kim
NGMM Senior Economist, Booz Allen Hamilton



Source: https://oll.libertyfund.org/

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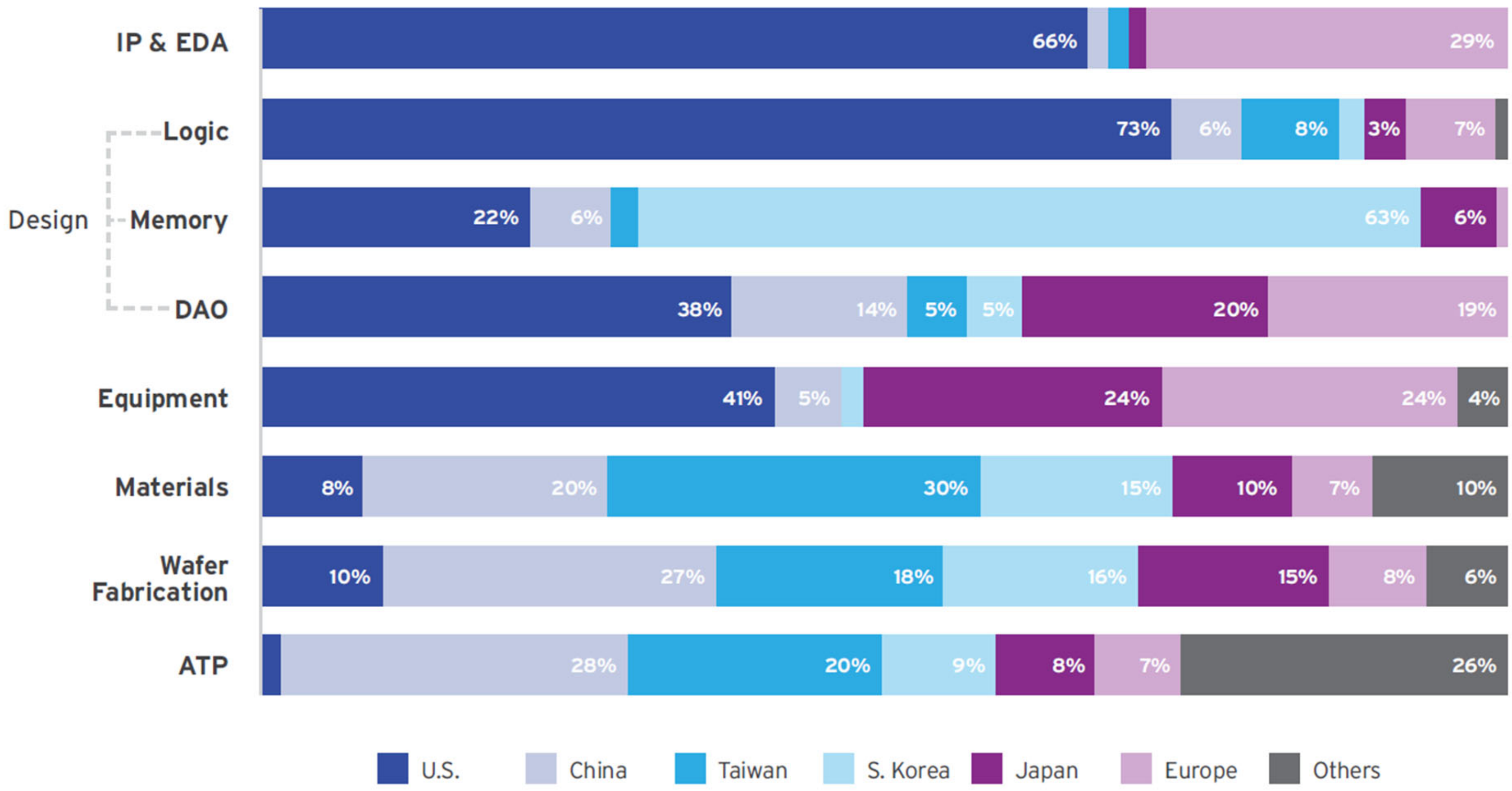
?!?!

Semiconductor Value Added by Activity and Region, 2024 (%)



Source: State of the U.S. Semiconductor Industry 2025 report, SIA.

DAO: Discrete, Analog, and Other
ATP: Assembly, Test, and Packaging

How Did the U.S. Lose the Semiconductor Industry?

Lower labor costs abroad

Foreign government industrial policy

Reinforced by:

- Declining specialized workforce
- Loss of “learning by doing” process
- High fixed costs and regulation
- Growing network of suppliers abroad

How Can the U.S. Compete?

- INNOVATE
- COMPETE ON QUALITY
- PARTNER

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- **INNOVATE**
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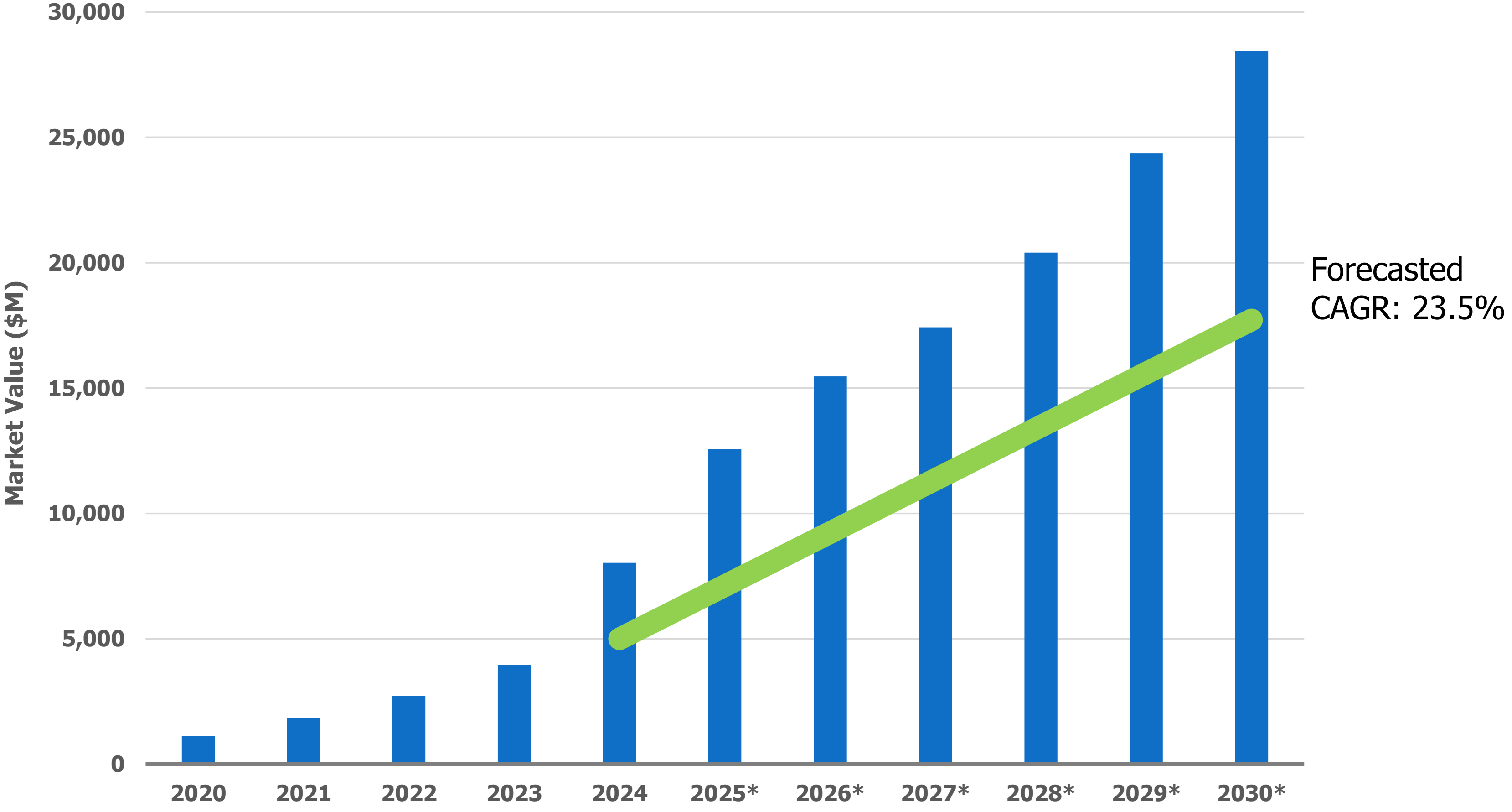
How Can the U.S. Compete?

- **INNOVATE – 3DHI**
- COMPETE ON QUALITY
- PARTNER

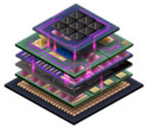
High End Performance Packaging Market Forecast



Forecasted
CAGR: 23.5%

Source: High End Performance Packaging 2025 report, Yole Group

Distribution Statement A: Approved for public release; distribution unlimited



Barriers to Entry in the 3DHI Market

Unavailability of mature ADKs and non-existent third-party IP support

Technical barriers (e.g. thermal, heterogeneous form factors, CTE mismatch)

Limited access to TSVs

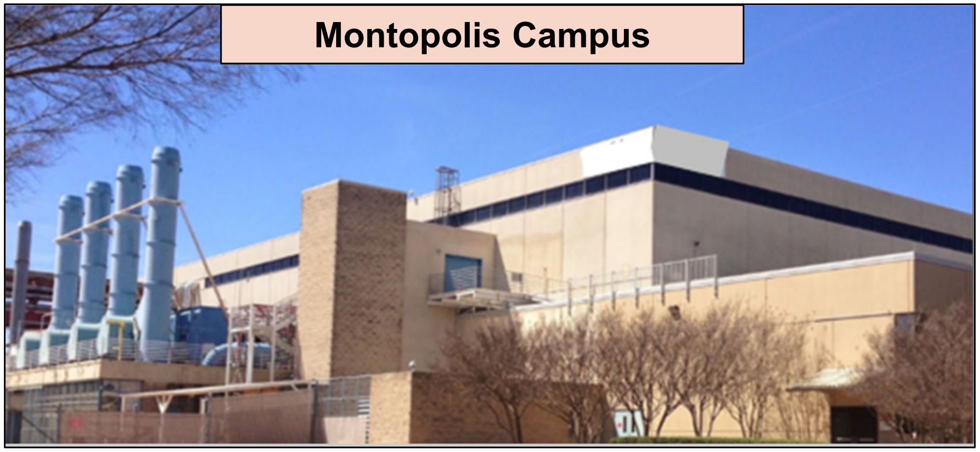
Limited access to wafers (both silicon and compounds)

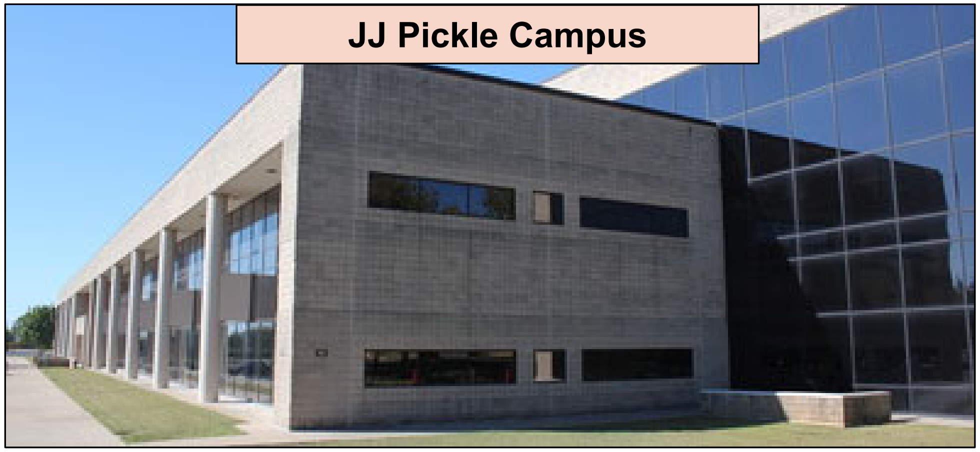
Demand > supply of hybrid bonding

General limited access to 3DHI capabilities

ADK: Assembly Design Kit
CTE: Coefficient of Thermal Expansion
TSV: Through Substrate Vias

TIE NGMM Center (TNC)


Montopolis Campus

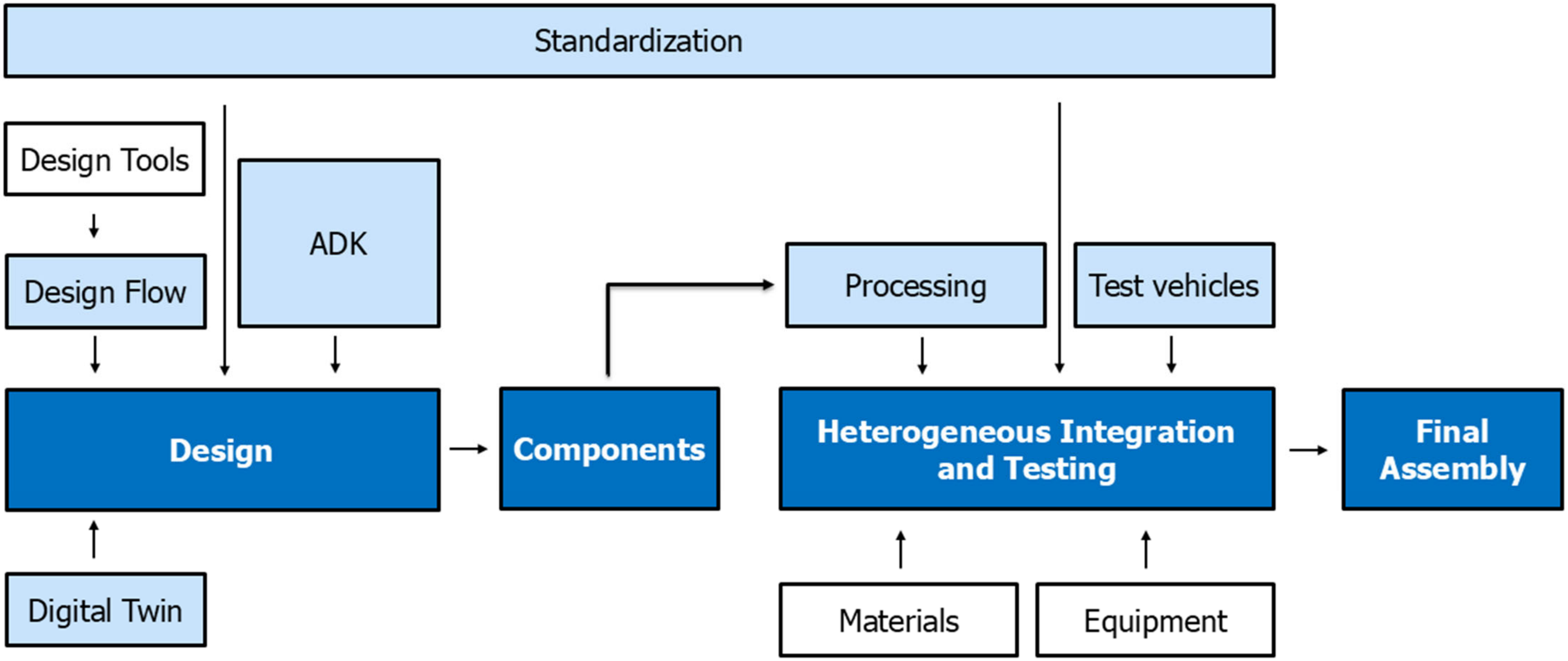

JJ Pickle Campus

Source: TIE

TNC will be a 3DHI innovation zone with state-of-the-art equipment, process and design enablement, and partners including DIBs, equipment and EDA companies, foundries, startups and universities.

DIB: Defense Industrial Base
EDA: Electronic Design Automation

How Is TNC Increasing Accessibility?



Standardization

Design Tools

Design Flow

ADK

Digital Twin

Design

Components

Processing

Test vehicles

Heterogeneous Integration and Testing

Materials

Equipment

Final Assembly

Light blue shaded areas provided by TIE

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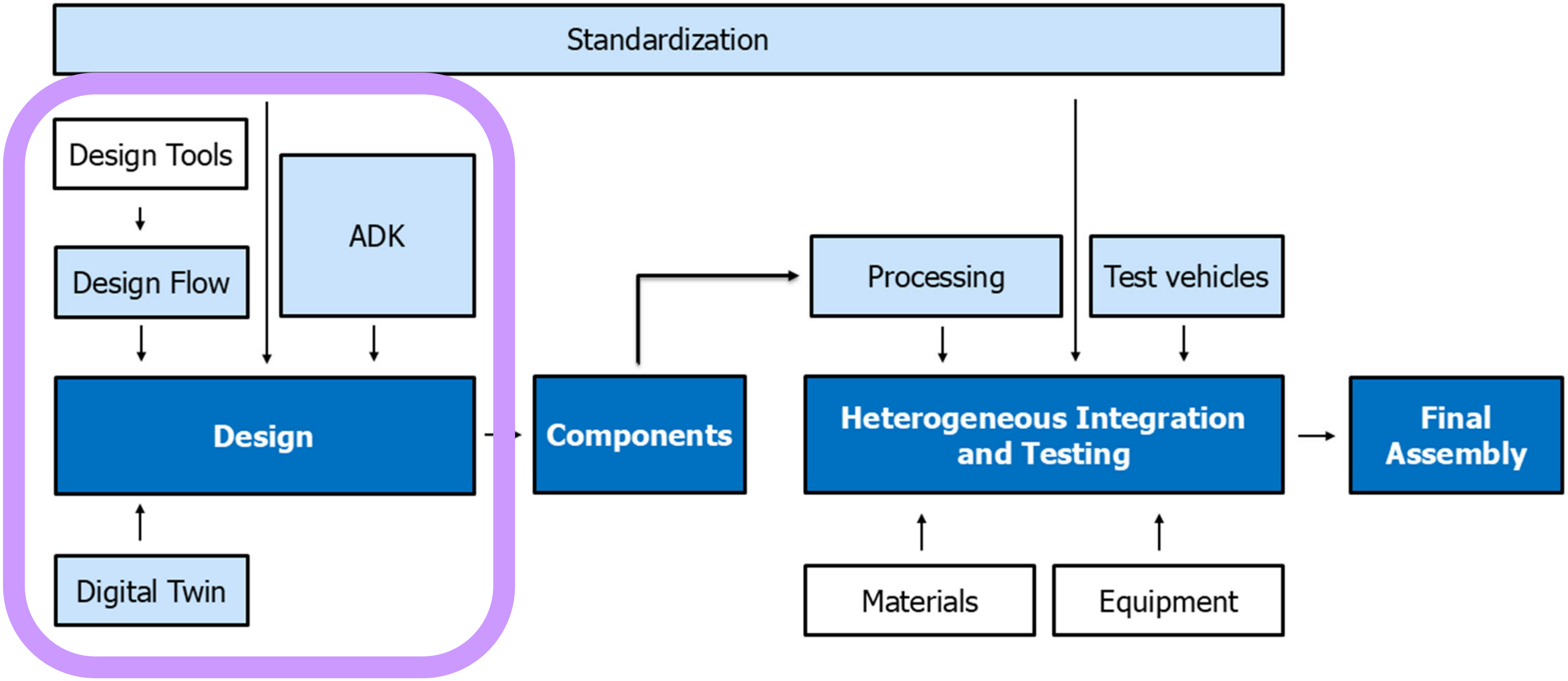

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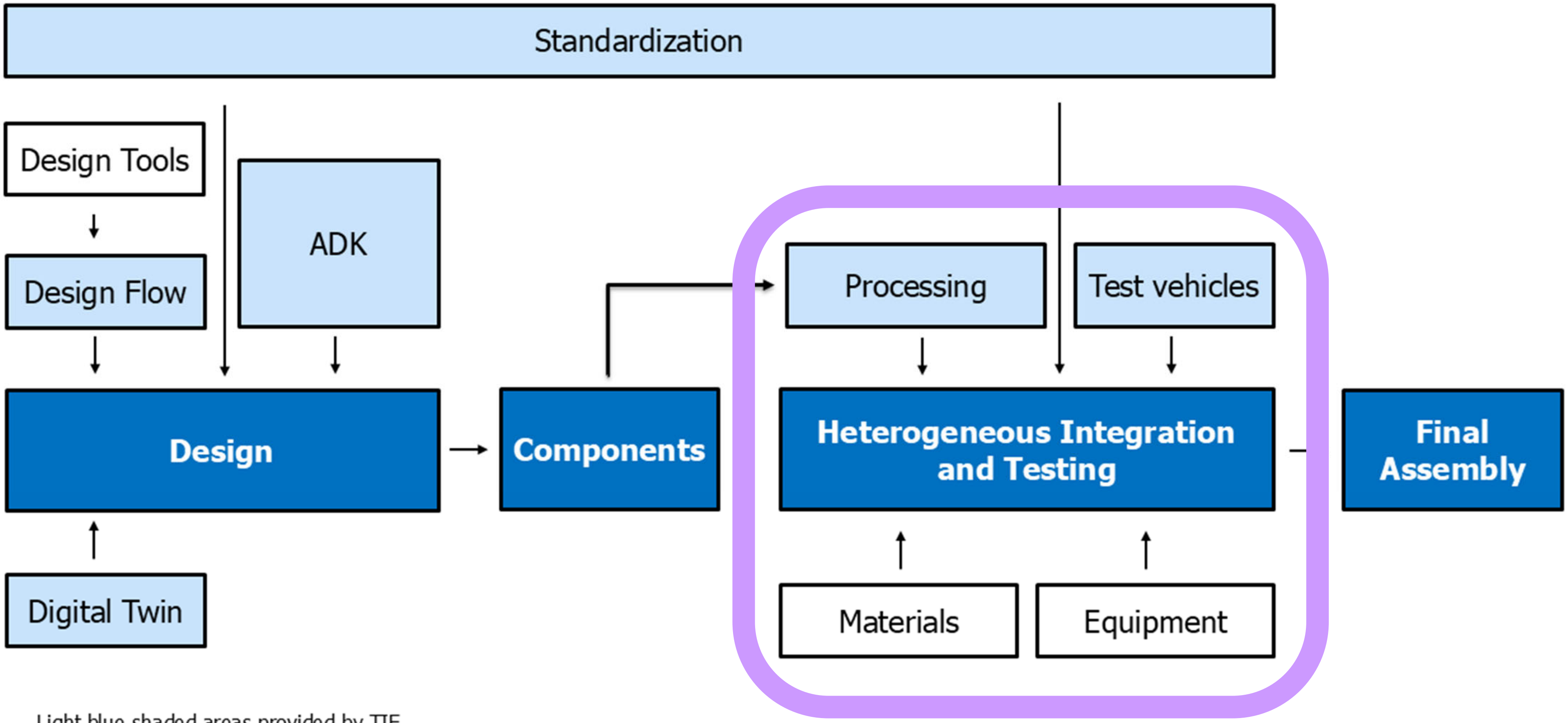

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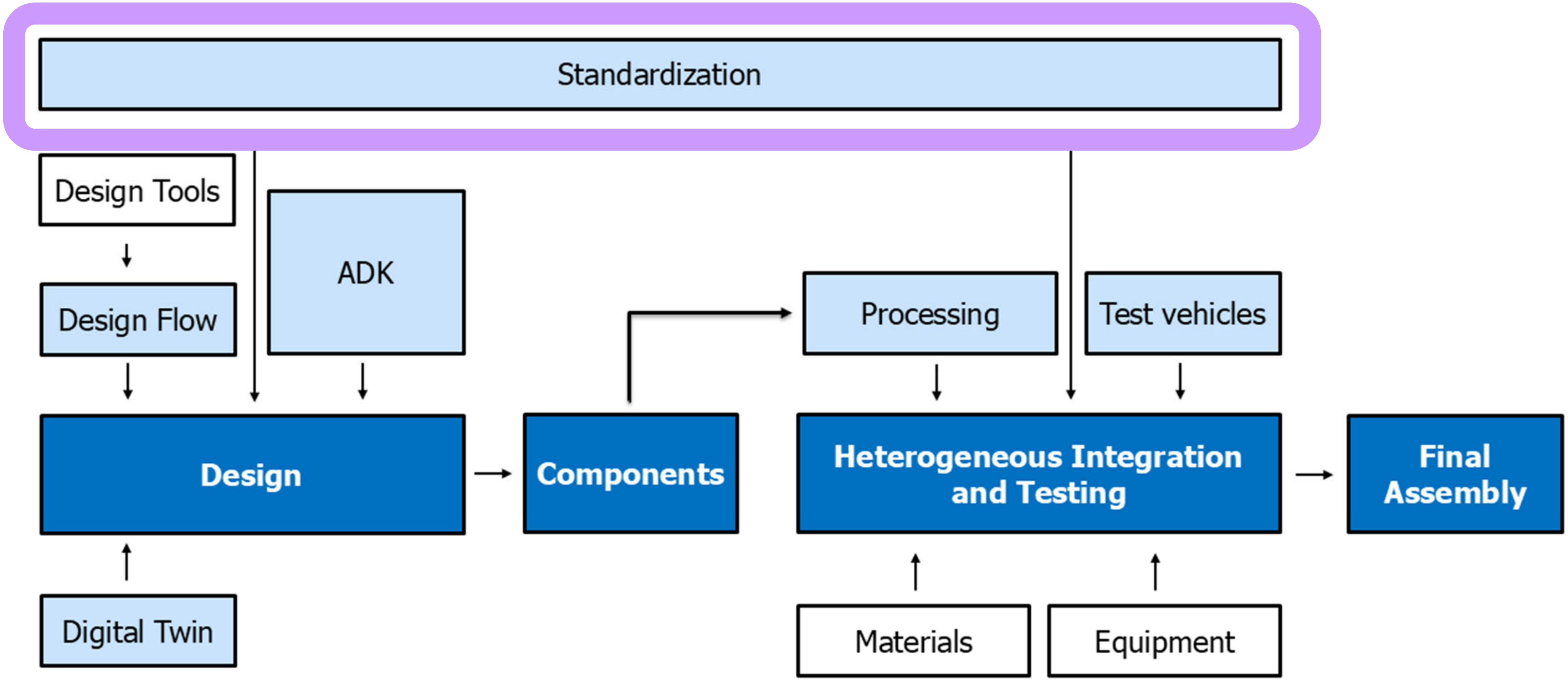

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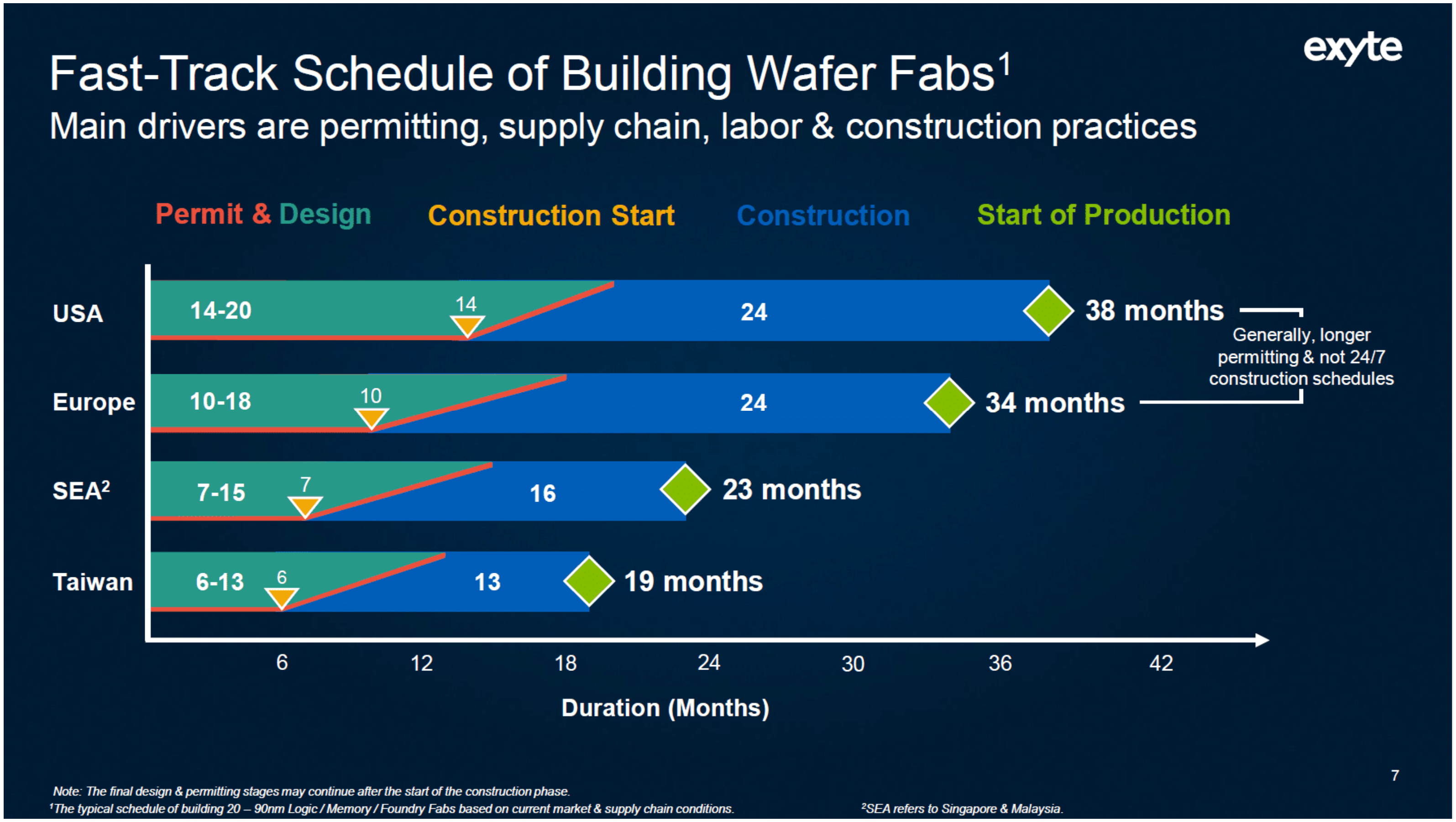
The U.S. Can’t Compete on Cost



Fast-Track Schedule of Building Wafer Fabs[1]

Main drivers are permitting, supply chain, labor & construction practices

Note: The final design & permitting stages may continue after the start of the construction phase.

[1] The typical schedule of building 20 – 90nm Logic / Memory / Foundry Fabs based on current market & supply chain conditions.

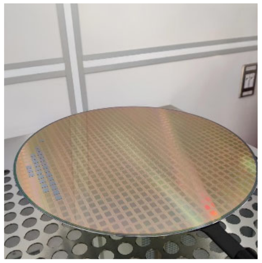
[2] SEA refers to Singapore & Malaysia.

Source: https://www.semiconductor-digest.com/building-fabs-in-the-u-s-vs-taiwan-twice-as-long-twice-as-much/

The TNC Experience

Design Enablement

Process Leadership



Source: TIE

Source: Microsoft

Customer Service

How Can the U.S. Compete?

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HDTV

Source: Samsung

Hsinchu Science Park

Source: https://www.idipc-hsinchu.org.tw/En/HSP

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"Partners influence more than 95% of Microsoft's commercial revenue, either directly, or in partnership with Microsoft."

Source: https://blogs.microsoft.com/blog/2021/02/10/microsofts-partner-ecosystem-enabling-innovation-and-business-resilience/

Partnerships…

Accelerate innovation

Expand markets

Mitigate risk

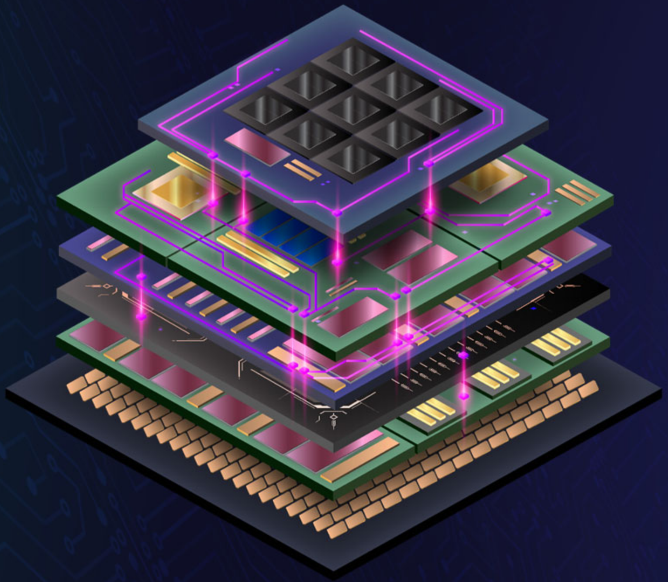
Lead to cost savings through shared resources

Enhance customer reach

The Key Is **TRUST**

Source: Microsoft

THANK YOU



For more information, visit:

www.darpa.mil/ngmm