Taiwan-Japan University Presidents' Forum

JACUIE 2025Jul16

Challenges of Universities in Japan and Taiwan in the Innovative Era

10:30-10:35	Introduction
10:35-11:00	Keynote Speech
11:00-11:10	Q&A session

The last and largest opportunity for the revival of Japan's semiconductor industry.

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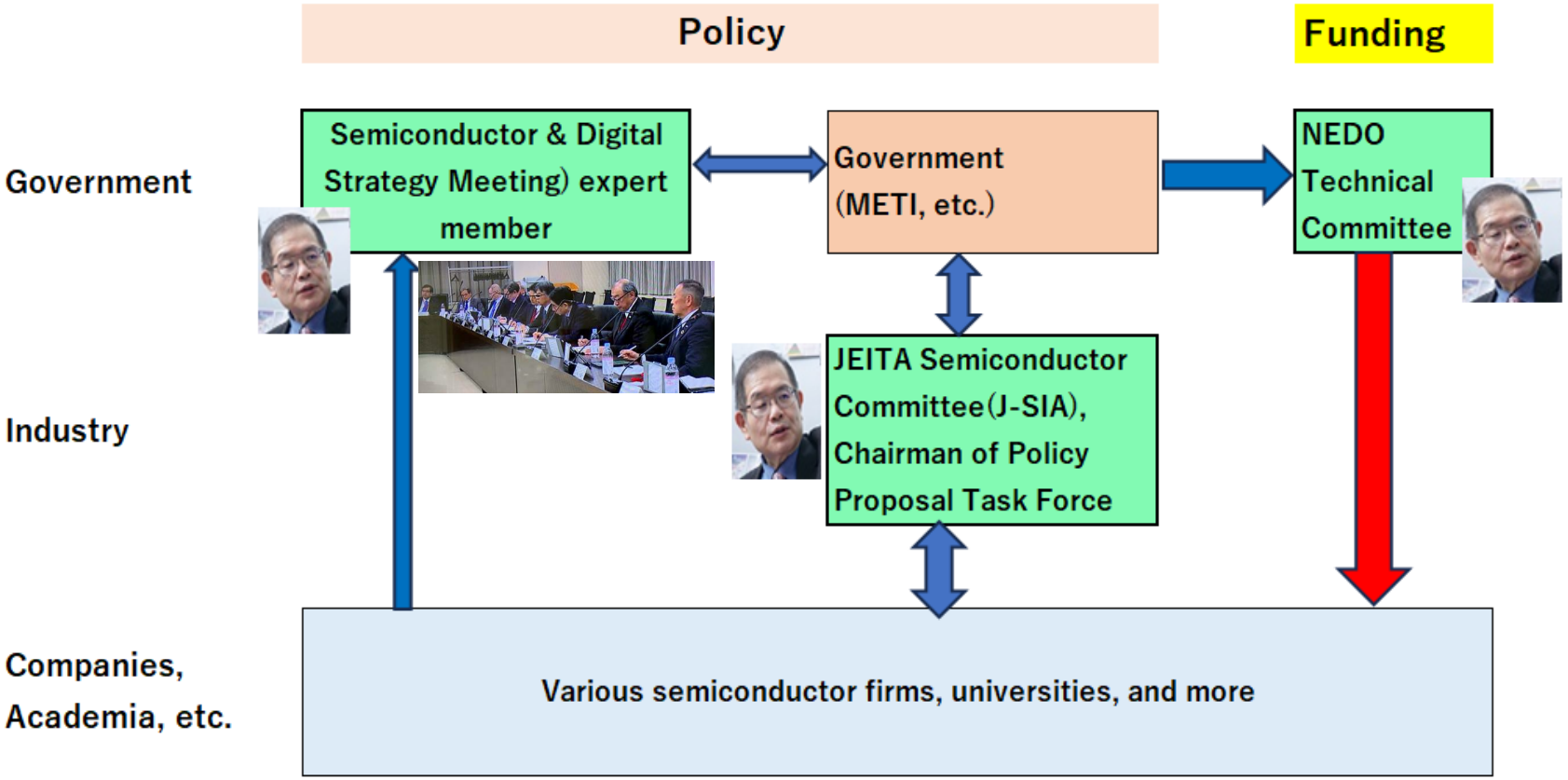
Semiconductor and Digital Industry Strategy Study Group Expert Members
JEITA Semiconductor Committee Policy Proposal Task Force Chairman
NEDO Technical Review Committee Member.

My Role and Involvement in Semiconductor Policy

METI – Semiconductor and Digital Industry Strategy Review Meeting Over 20 regular members

NEDO Technical Committee member on the review board for the Post-5G Fund and GI Fund

JEITA Semiconductor Committee(J-SIA)　Chairman of the Policy Proposal Task Force



Source: Hideki Wakabayashi

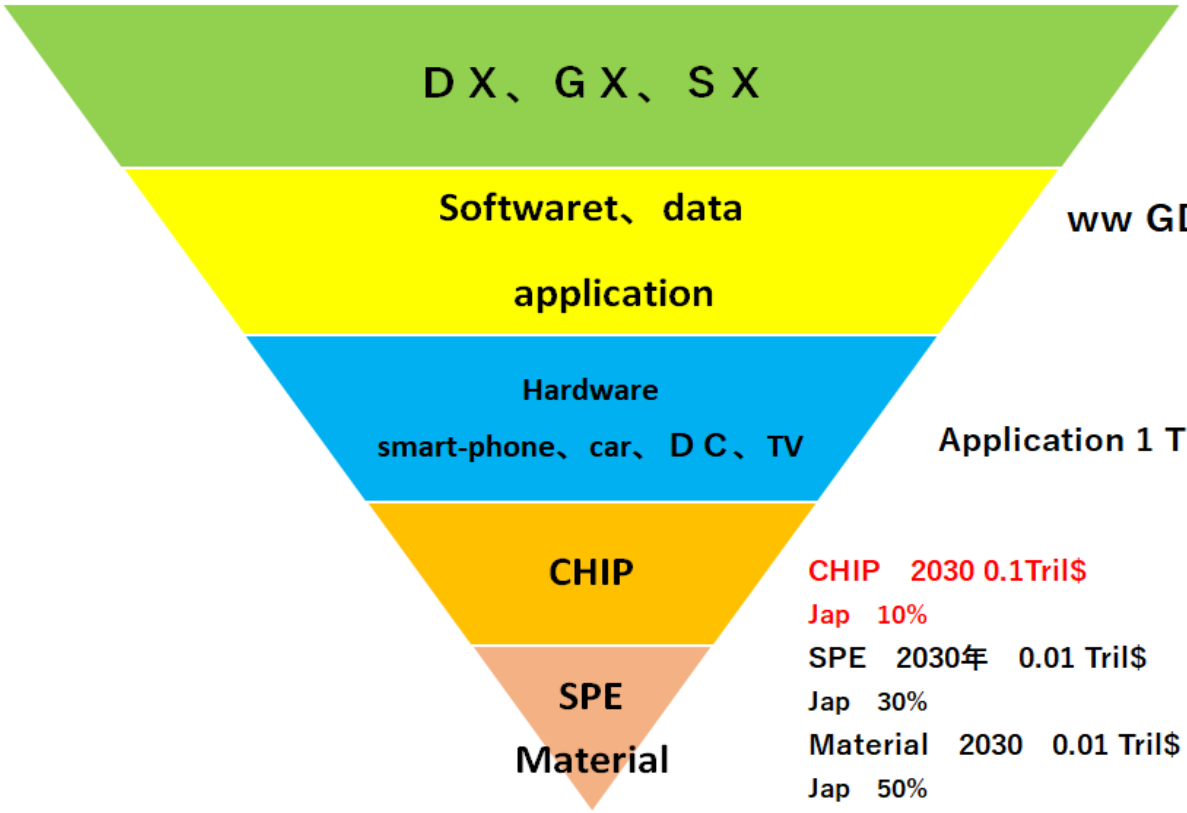
Si−cycle

Semiconductors: 1985–2025, growing within the silicon cycle. From 2024, they will experience significant expansion driven by generative AI and data centers

Source: Hideki Wakabayashi

Not all segments of the semiconductor industry have lost.

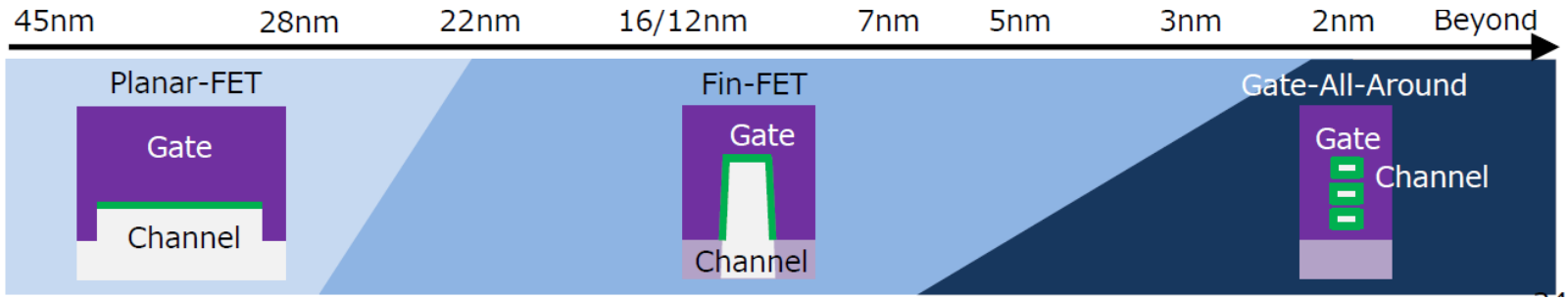
The weak ones are the advanced logic and fabless/foundry sectors that have failed to keep up, while sensors, NAND, analog, power, manufacturing equipment, and materials remain strong



Source: Hideki Wakabayashi

METI Projects

	Step1	Step2	Step3
Plan	Emergency reinforcement of semiconductor production base for IoT in 2020 (TSMC Kumamoto attraction)	Next-generation semiconductor technology base (Beyond 2nm) through Japan-US cooperation in 2025	Future technology base (optoelectronic fusion) through global cooperation in 2030
Results	Attracting TSMC to Tsukuba、Kumamoto(JASM)	Rapidus、LSTC (with IBM & IMEC)	—
Other Results	Power semiconductor NEDO projects started	Strengthening semiconductor personne	—
Evaluation	Excellent	Good	—
Issues	EDA, chiplets, packaging, power semiconductors.		



Source：Hideki Wakabayashi & METI

A final, yet greatest opportunity has arrived

Major Policy Shift: Learning from past mistakes, with an emphasis on continuity and responsible commitment

The difference from previous policies

Up until now	This time
Slow and small, a pie in the sky.	Fast and large, societal implementation - Step 1, Step 2, Step 3 - already with nearly one trillion yen from NEDO funds (Post-6G, GI).
Hinomaru only (Big electronics company)	International collaboration (TSMC, IBM, IMEC, etc.)
For the industry (a device manufacturer).	Users (insufficient supply chain disruptions), for the world (national security), devices, and materials too.
Only More Moore	More than Moore, as well packages, materials, SPEs, and design too.
METI and some top players	politics, agencies, international entities, academic , and mid-sized companies.

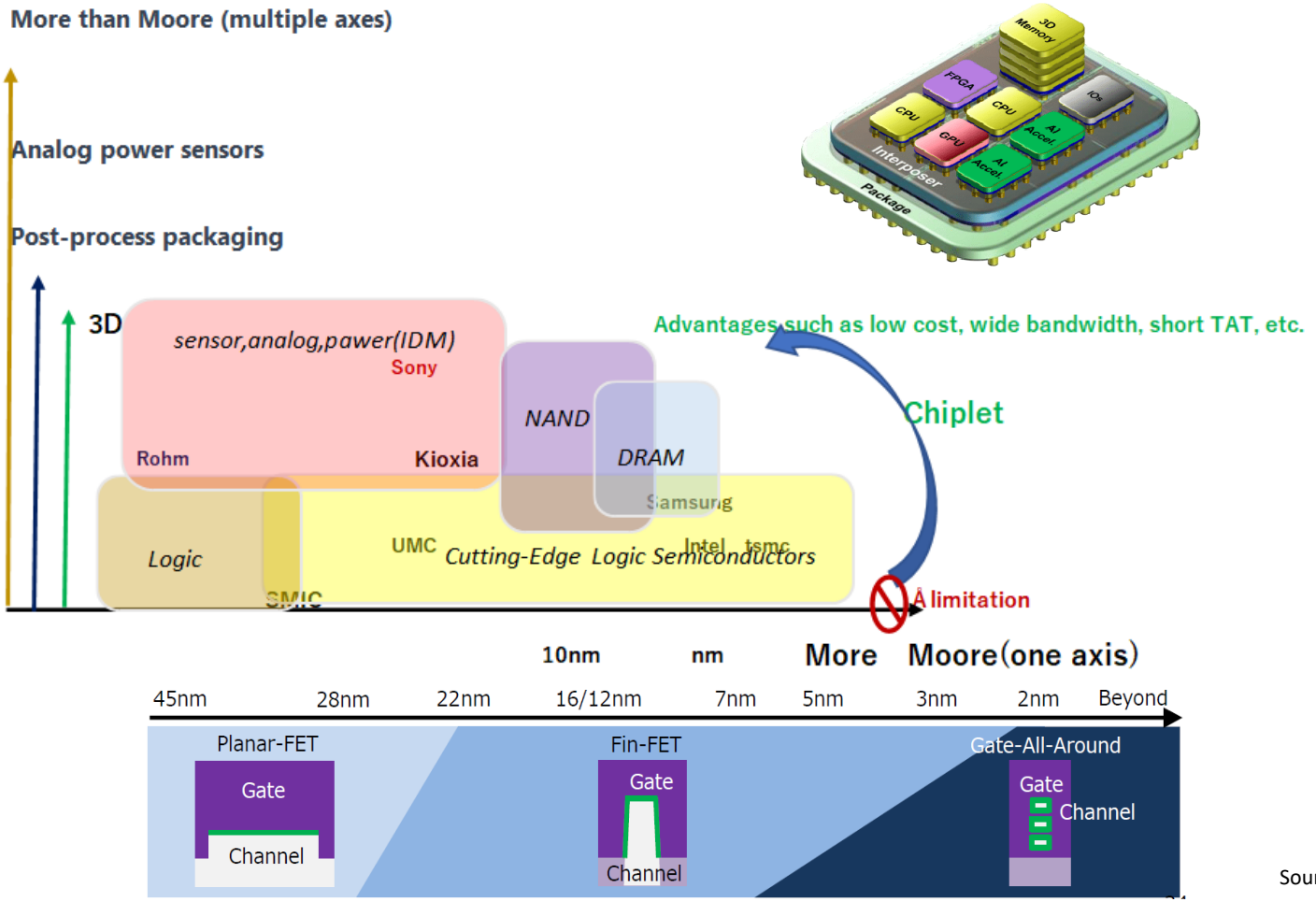
Source : Hideki Wakabayashi

Theory of Digital Japan Archipelago Evolution

	Theory of Japan Archipelago Transformation	Theory of Digital japan Archipelago Evolution.
GDP	100 trillion yen (4th place), 1 million yen per capita (30th place), exchange rate fluctuated from 360￥ to 300 ￥	500 trillion yen (3rd place), 4 million yen per capita (20th place), exchange rate 100-110 ￥/$
Population	110 million, labor force of 52 million, birth rate of 2.1, average life expectancy of 70 years old.	120 million, labor force of 60 million, birth rate of 1.2, average life expectancy of 85 years old.
Background	Excessive urban concentration and pollution.	Covid-19 pandemic, work style reform (telework)
Objectives	Industrial relocation, regional dispersion through transportation network.	Regional dispersion and DX through information and communication network.
Means	Shinkansen, highways, bridges.	Data centers, base stations + optical fiber network, EV stations, smart grid.
Industries	Iron, cement.	Semiconductors.

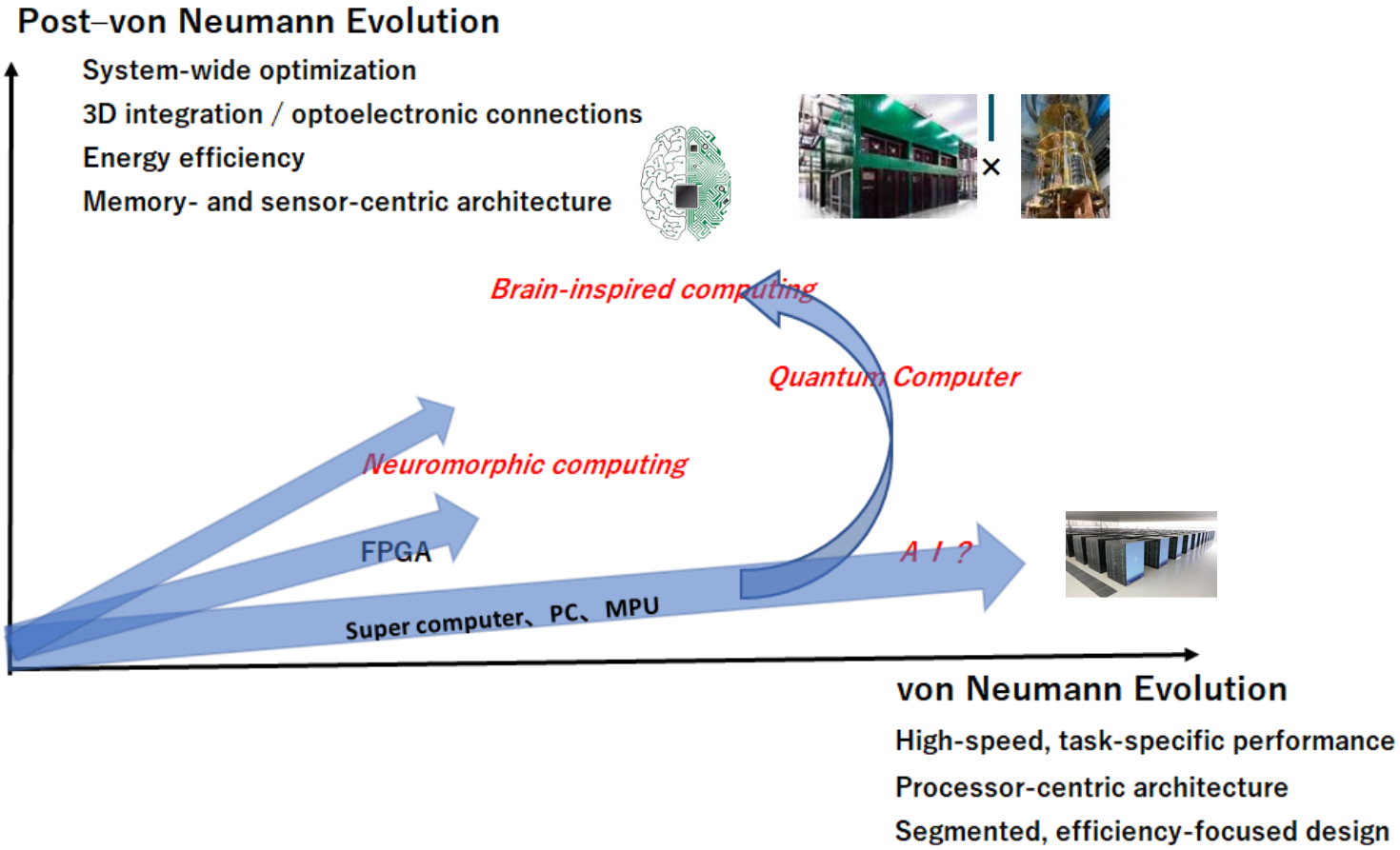
Source : Hideki Wakabayashi

Technology is not just limited to fine processing on the "More Moore" axis! There are multiple axes of diverse development, such as 3D (package + stacking) on the "More than Moore" axis.



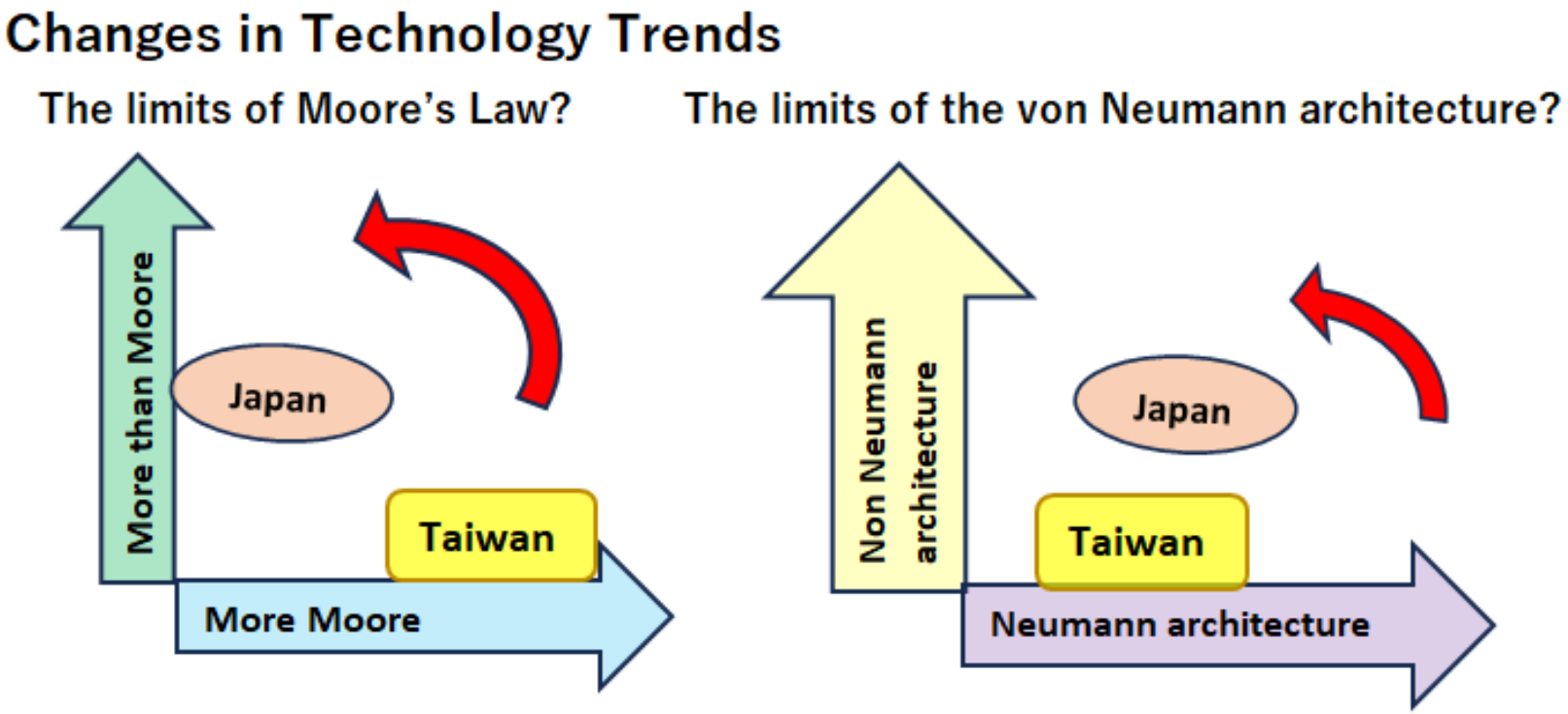
Source : Hideki Wakabayashi & METI

The long-standing von Neumann architecture is approaching its limits due to issues such as heat generation and the need for ever-increasing speed.
As a result, computing is shifting from a CPU-centric model to one centered around memory and sensors. Diverse non–von Neumann architectures—such as quantum computing and even brain-inspired models—are emerging and are likely to coexist in the future.



Source：Hideki Wakabayashi、METI

In terms of technological trends, Japan and Taiwan can complement each other.



Source : Hideki Wakabayashi

A Once-in-a-Half-Century Opportunity Meeting U.S. Expectations The world's industrial structure encompasses

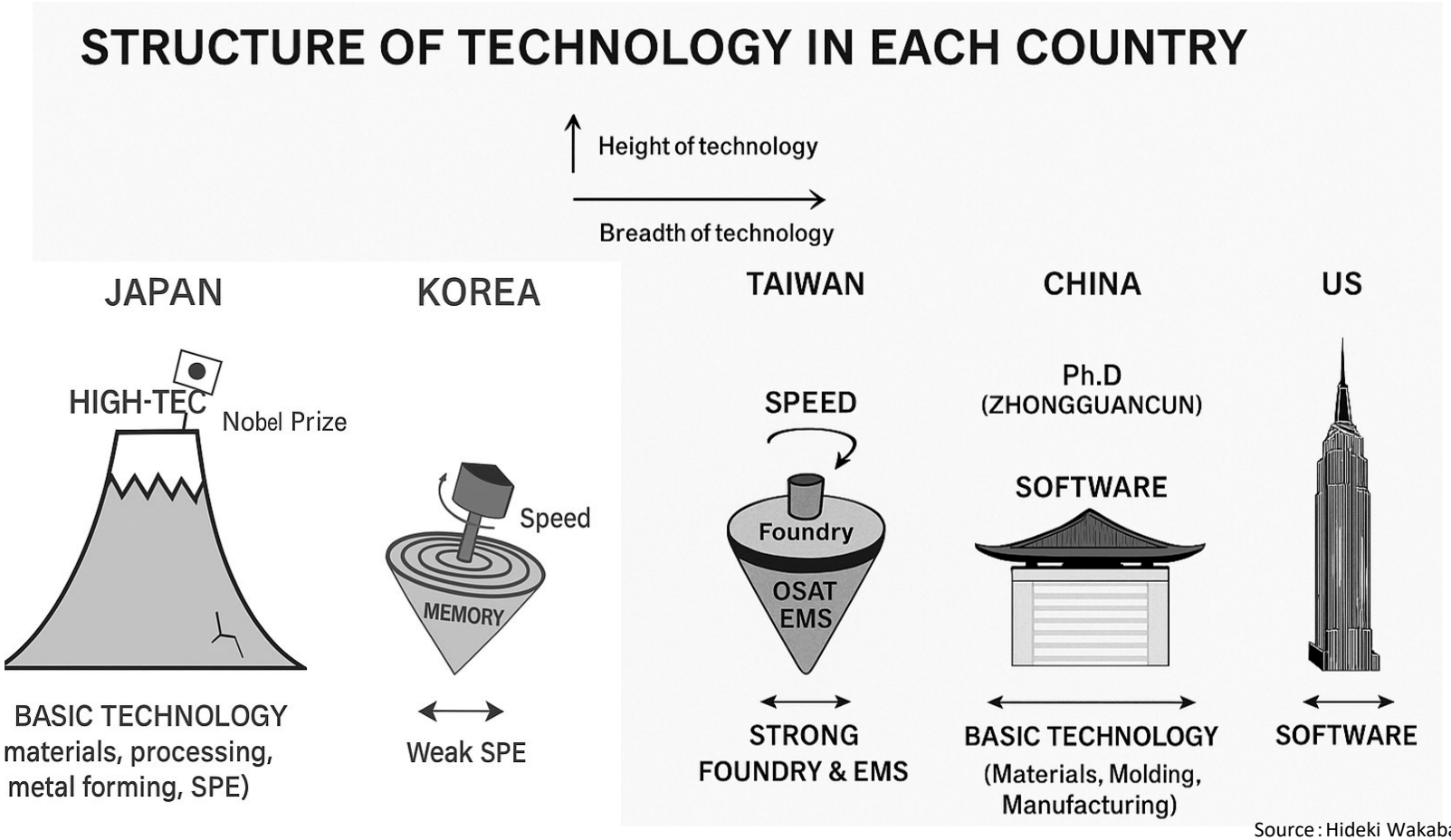
Within the Four-Layer Industrial Structure, U.S. Expectations and Responses

- 1980s: High expectations for Japan, followed by subsequent disappointment
- After the 1990s: Japan's role was taken over by South Korea, Taiwan, and China
- *From 2020 onward: The United States may be disappointed in China*

		80s－90s		90-2020	2020-	
		U.S. Expectations of Japan	Japan-U.S. Friction	Actual US Expectations	2020- China Policy	U.S. Expectations of Japan
The Hierarchy of Industrial Structures.	Finance	US	US	US	China (US disappointment)	US
	Soft PF	US	Japan (US disappointment)	US		US
	Science and Technology	US-Japan Cooperation		US-Korea -Taiwan		US-Japan-Taiwan
	Manufacturing	Japan		China		Japan-Taiwan

Source: Hideki Wakabayashi

Comparison of Industrial Structures Across Countries



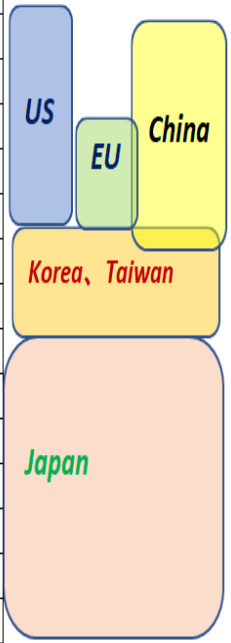
Source : Hideki Wakabayashi

In the industrial technology hierarchy, the higher the layer, the more critical the business model becomes

— an area where Western countries and China hold significant advantages

Industrial structure of cutting-edge technologies

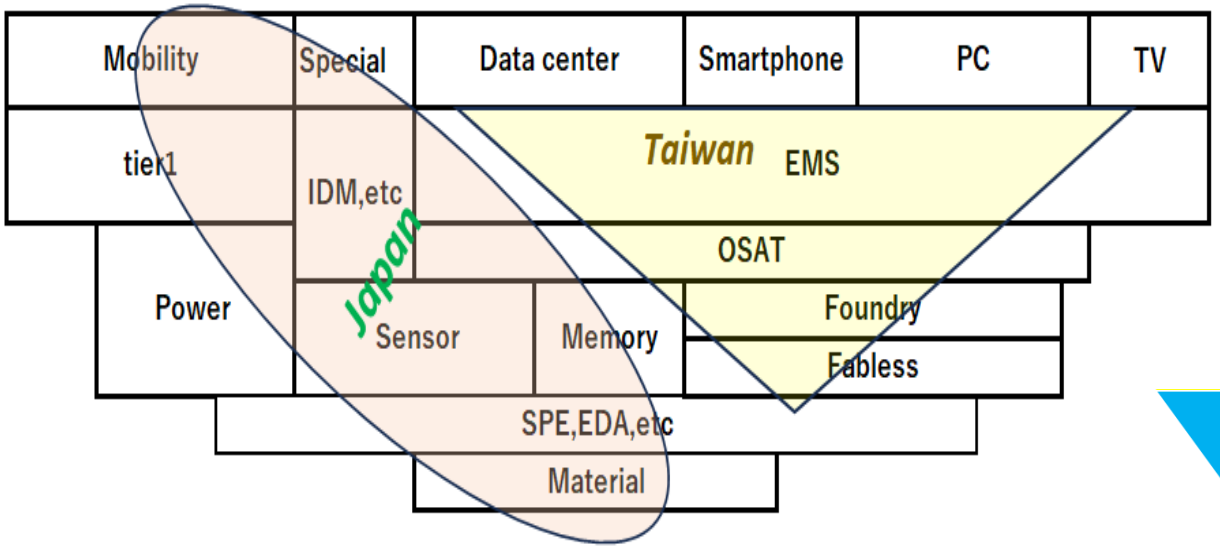
Product		Smartphone、TV、etc				EV、Drone、white-goods			
Technical system		AI IoT Big Data			IoT 5G ADAS		ADAS EV Drone Robots		
Classification		VR/AR	A I	Big Data	IoT	⇔ 5 G ⇔	ADAS	EV	Drone
Business	Business model	✓	✓	✓	✓	✓			
	App	✓	✓	✓	✓	✓			
Software	Computing	✓	✓	✓	✓	✓	✓	✓	
	Network		✓	✓	✓	✓	✓	✓	✓
	Control, etc.		✓				✓	✓	✓
Device	Processor (architecture)		✓	✓	✓		✓	✓	✓
	Memory		✓	✓			✓	✓	
	Panel UI	✓					✓	✓	
	Sensors (camera, antenna, sound, etc.)	✓			✓	✓	✓	✓	✓
	Transmitter (light, radio wave, sound)				✓	✓	✓	✓	✓
	Motor						✓	✓	✓
	Power, battery, power supply, etc.				✓	✓	✓	✓	✓
Manufacturing	Processing, micro/3D, etc.				✓	✓	✓	✓	✓
	Materials, creation/analysis, etc.				✓	✓	✓	✓	✓

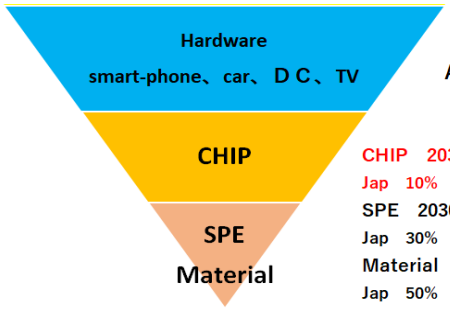


Source：Hideki Wakabayashi

From the perspective of industrial structure, Japan and Taiwan are well-positioned to coexist and complement each other.

Industrial structure



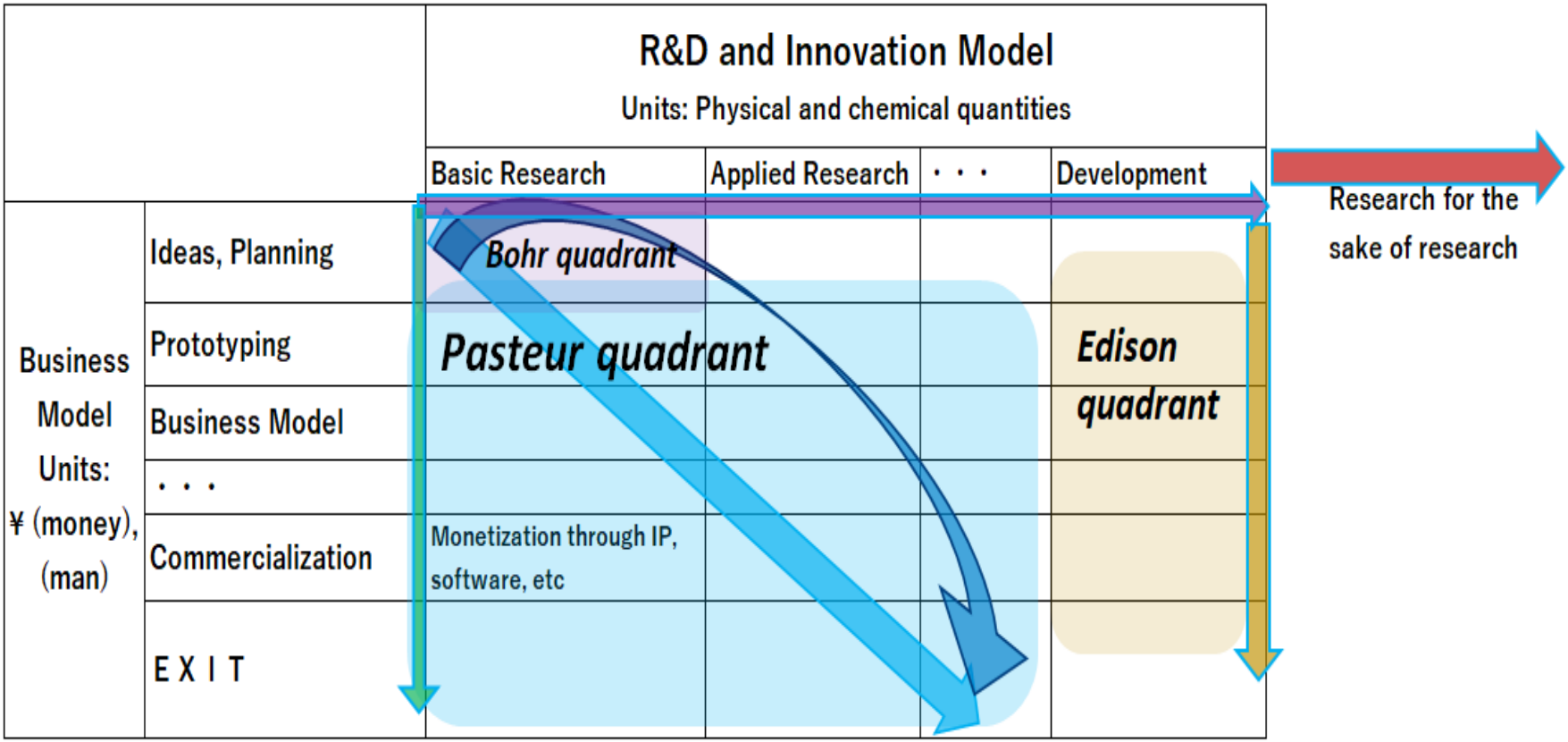


Application 1 Tril $

CHIP 2030 0.1Tril$
Jap 10%
SPE 2030年 0.01 Tril$
Jap 30%
Material 2030 0.01 Tril$
Jap 50%

Source：Hideki Wakabayashi

R&D/Innovation Model & Business Model



Source : Hideki Wakabayashi

R&D 4 quadrants of Stokes

4 quadrants of Stokes

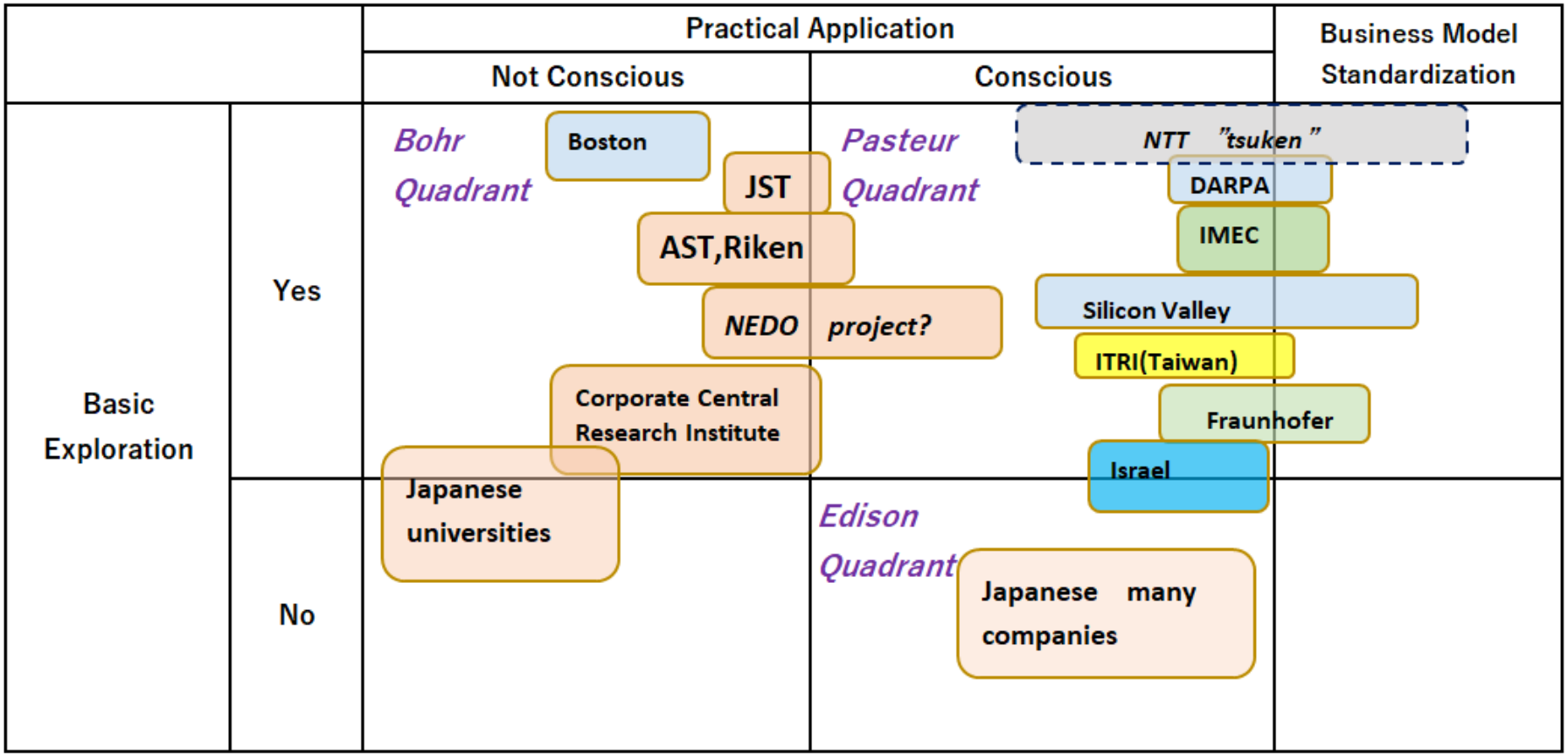
	Do not set purpose	Set purpose
Exploring the Principles	Bohr quadrant	Pasteur quadrant
Not exploring the principles		Edison quadrant

World and Japan 80's

	Do not set purpose	Set purpose
Exploring the Principles	Univ.	DARPA, Fraunhofer, (NTT Public Corporation Lab.)
Not exploring the principles		Corp. Lab.

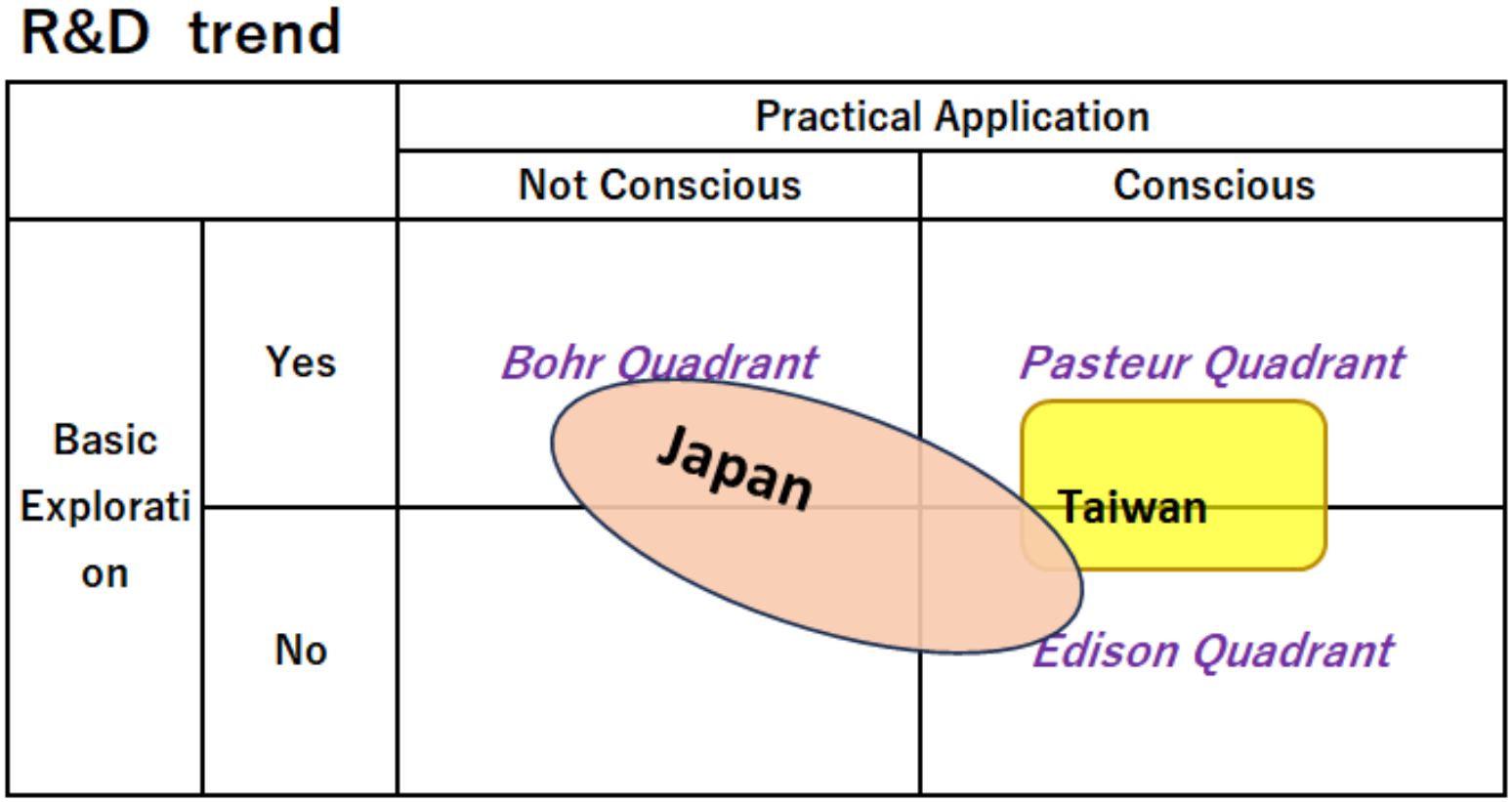
Source : Hideki Wakabayashi

The Global Innovation Ecosystem and Stokes' Four Quadrants



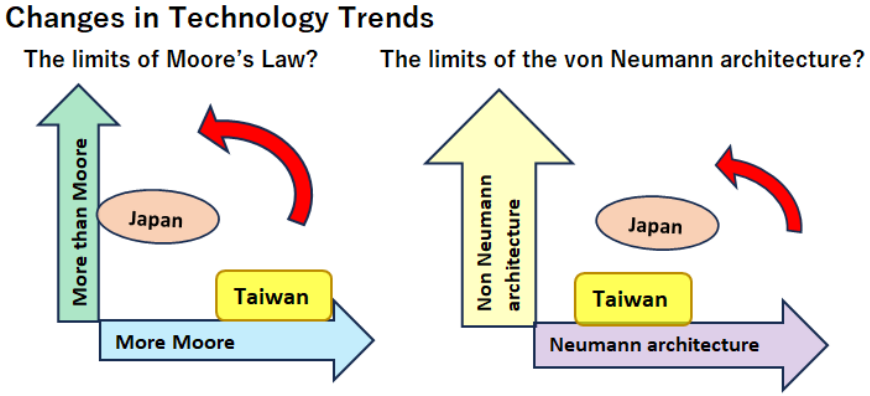
Source : Hideki Wakabayashi

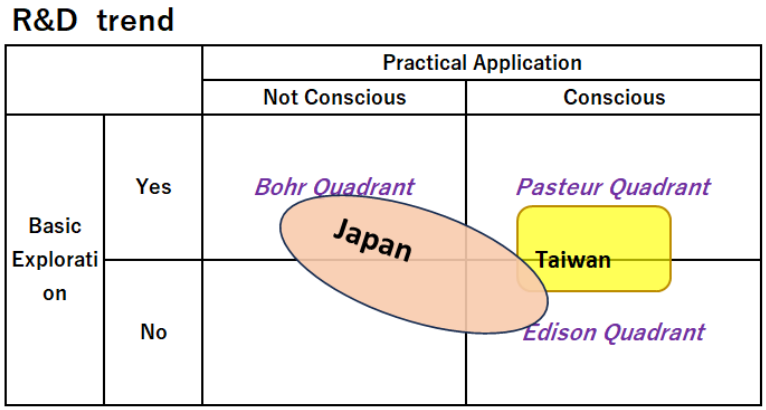
Japan and Taiwan also play complementary roles in their approaches to R&D and innovation.

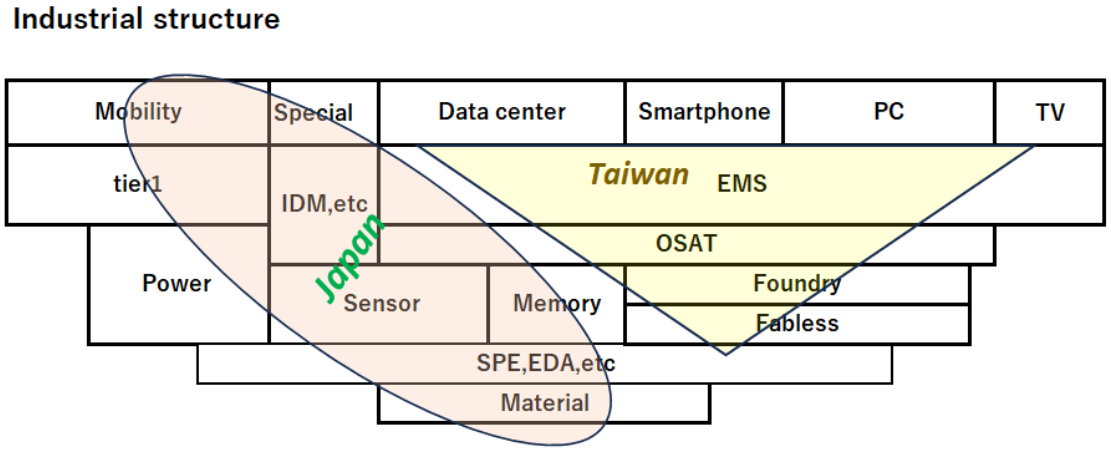


Source : Hideki Wakabayashi

Japan and Taiwan are complementary in tech, R&D, and industry trends.

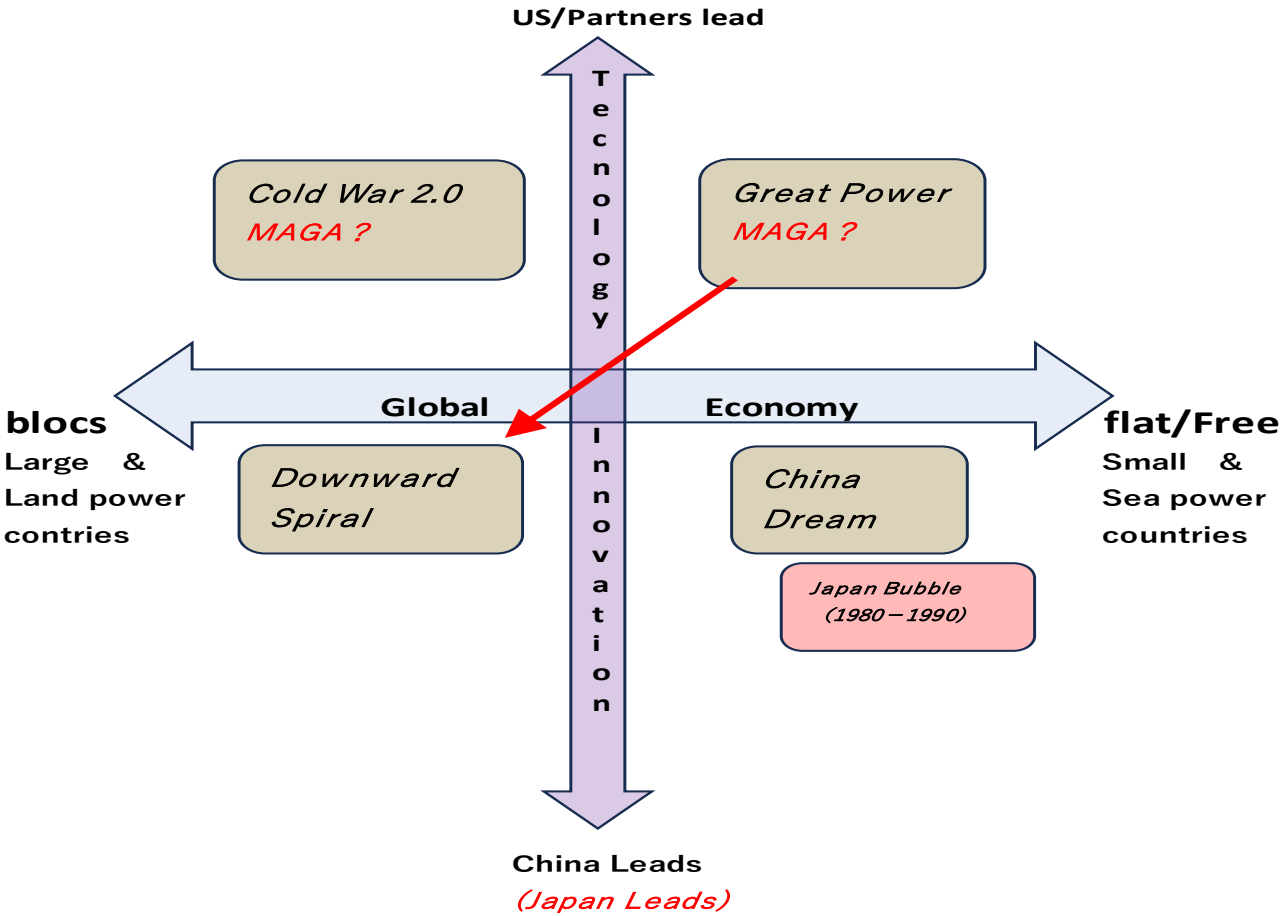






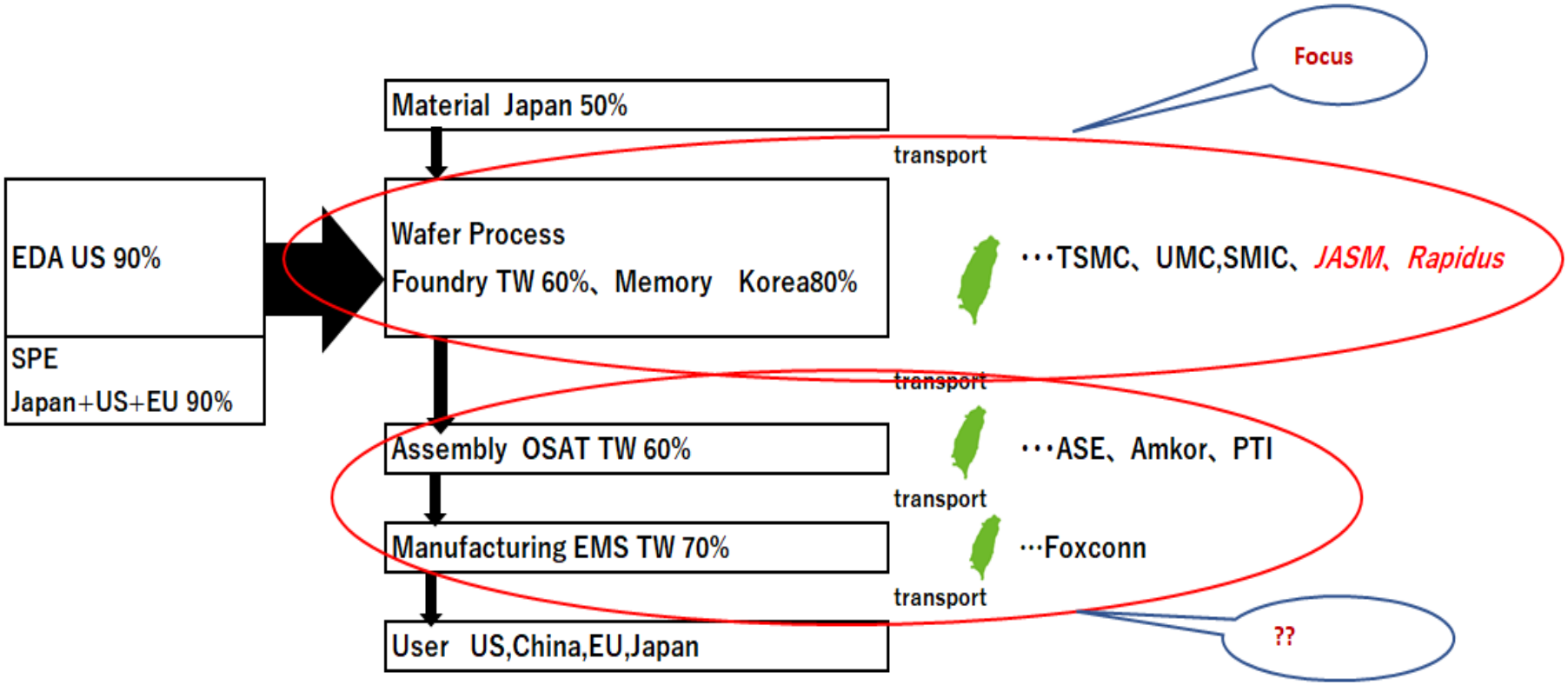
Source : Hideki Wakabayashi

A four-quadrant scenario framework based on two axes within the Si-Triangle



Source：Si Triangle Hideki Wakabayashi

While the spotlight in the semiconductor industry is often on front-end wafer processes, back-end operations—particularly OSAT—remain underdiscussed, despite their critical importance in the supply chain.



Source：Hideki Wakabayashi

J-OSAT

We established the Japan OSAT Federation, an industry association for semiconductor assembly and testing (OSAT) companies, on April 21, 2025, and officially registered it as a general incorporated association on May 2, 2025.

[一般社団法人日本OSAT連合会｜半導体後工程産業のさらなる強化と発展を目指します]

In the complementary relationship between Japan and Taiwan, Japan has strengths in materials and equipment, while Taiwan leads in fabless design, foundries, OSAT, and EMS. They also complement each other in memory and DAO. However, neither country has a strong presence in EDA.

	EU	US	Jap	TW	korea	China
Material	O	O	◎ →			△?
SPE(Wafer process)	△	O	O →		△	△?
SPE(test assemble)	△	△	O →		△	△
EDA		◎				△?
IDM(Memory、DAO)	O	△	O	△	O	△
Fabless		◎	△	O		O
Foundary		O	← ◎		△	△
OSAT/EMS		△	← ◎			△

There is a pressing need to cultivate a next-generation EDA industry tailored to the demands of the chiplet era

◎ Strong

O Mid

△ Weak

Source : Hideki Wakabayashi

Evaluating regions geopolitically requires metrics like:

①Geostrategic Value(Latitude and longitude)
②Land area
③Access to rare resources
④Technological industrial clusters(SEMI、DC)
⑤Economic ecosystems

	TW	Okinawa	KyuSyu	Honsyu ＋Sikoku	Hokkaido
Economic value	Mid	Low	Mid	High	Low
The value of technology　SEMI、DC	High	Low	High	High	Low⇒High
The strategic value of rare resources	Low	Low	High	High	High
The value of a country's land area	Mid	Low	Mid	High	Mid
Geostrategic value	High	High	High	High	High

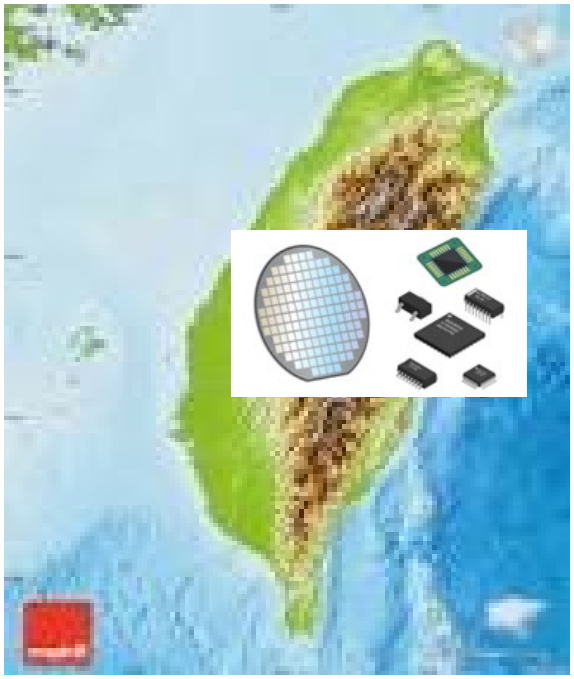
Source：Hideki Wakabayashi

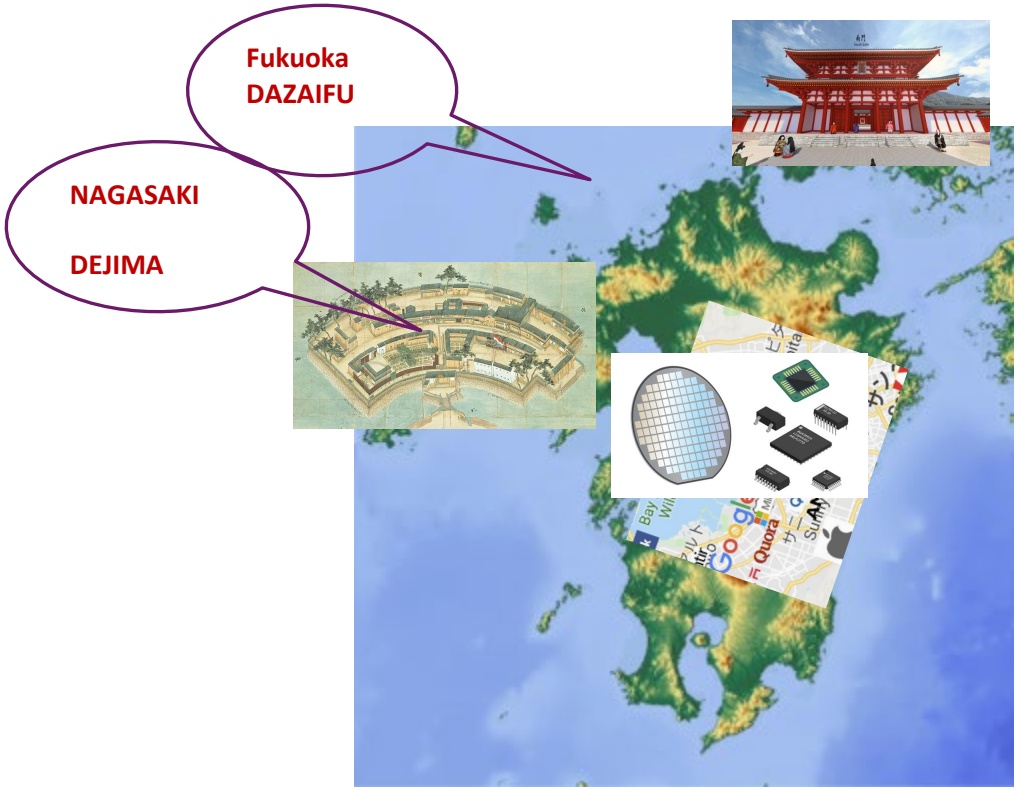
Rather than considering ecosystem models for Kyushu or Taiwan in isolation, we should first envision an integrated ecosystem between Kyushu and Taiwan.

	TW	Okinawa	KyuSyu
Economic value	Mid	Low	Mid
The value of technology　SEMI、DC	High	Low	High
The strategic value of rare resources	Low	Low	High
The value of a country's land area	Mid	Low	Mid
Geostrategic value	High	High	High

Source：Hideki Wakabayashi

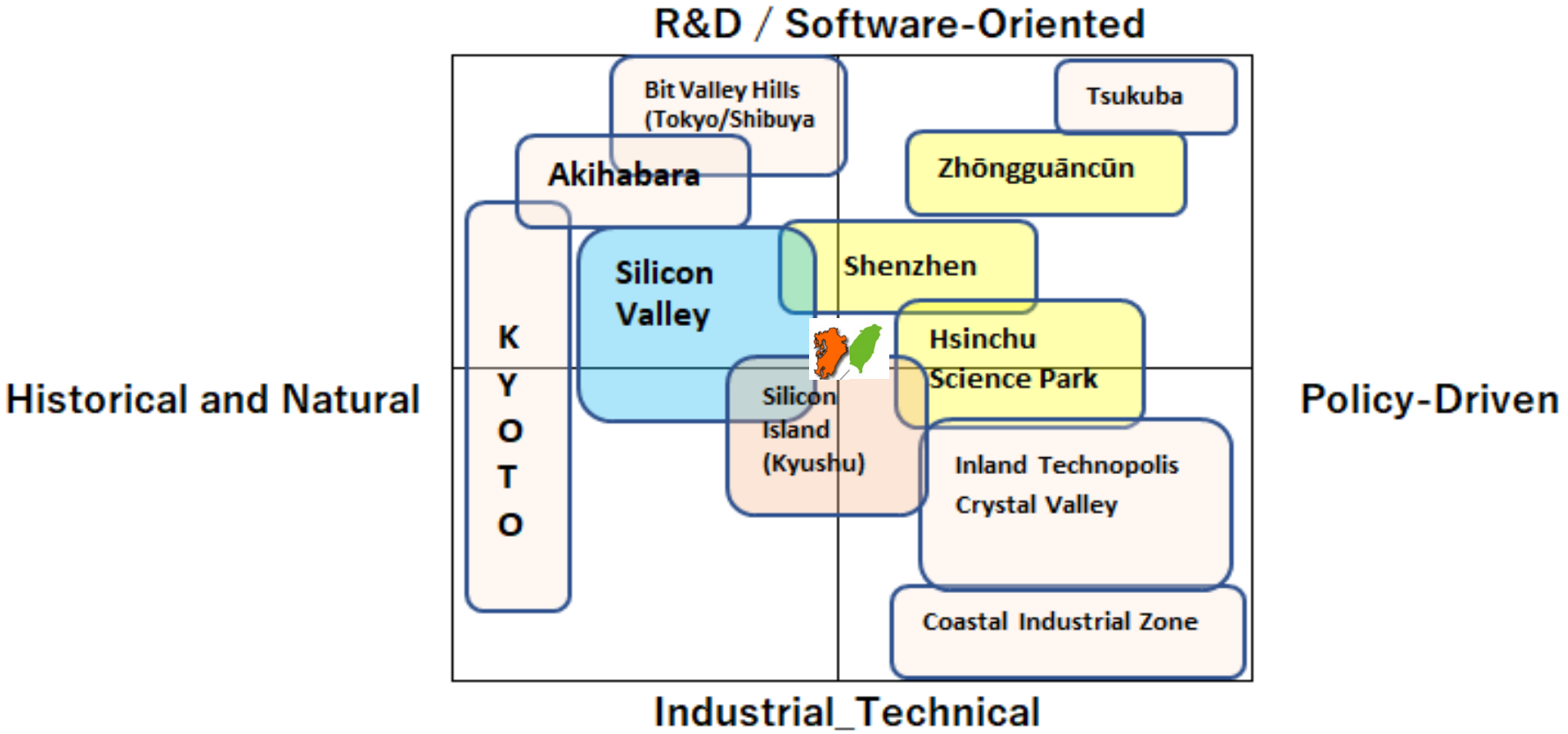
In the Heian period, it was Dazaifu; in the Edo period, Dejima; and today, as Silicon Island — Kyushu has always been globally connected





High-tech investment drives regional development: Cluster formation and ecosystem building.

Regional Development Patterns



Source : Hideki Wakabayashi

Is becoming Silicon Valley possible?

Condition	Stage			Cases				
	Early	Growth	Maturity	Kumamoto	Tsukuba	Silicon Valley Kyoto	Akihabara Shenzhen	Bit Valley Hills
Regional culture / Living infrastructure	○			○	△	○	○	○
Specialized industry	○			○		○	○	○
R&D / Universities	○			○	○	○	△	
Venture ecosystem		○		△?	△	○	○	○
Government / Institutional support		○		○	○	○	△	
Vision / Narrative		○		○	△	○	○	○
Cross-industry integration			○	○		○	○	
International recognition			○	○	○	○	○	○
Diversity / Density / Local engagement			○	○		○	○	

Notes

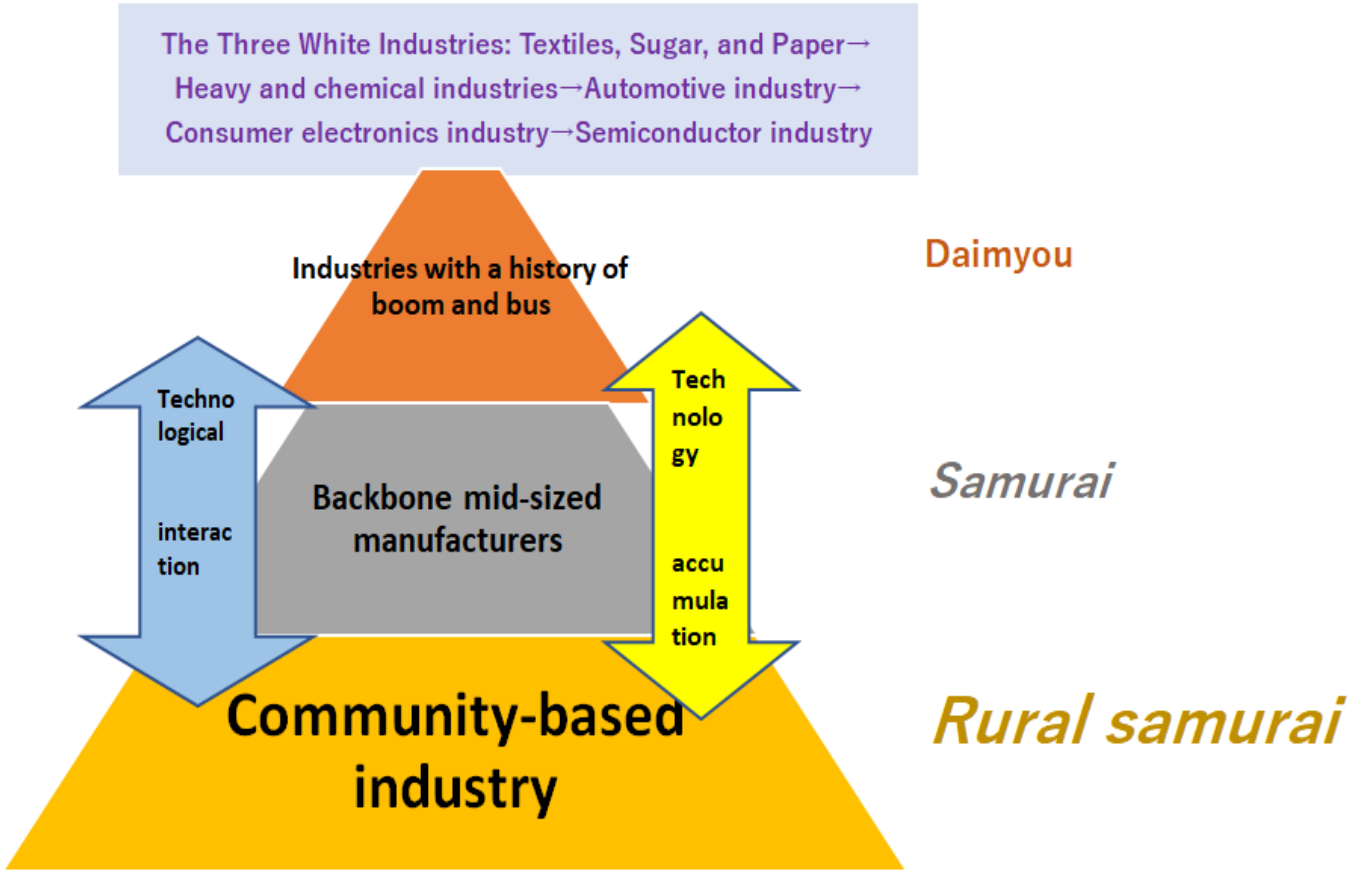
○ : Fully meets the condition / Clearly satisfied

△ : Partially meets the condition / Emerging or developing

? : Uncertain / Insufficient information

Source : Hideki Wakabayashi

Industries rise and fall, but resilient small and medium-sized enterprises persist — nurturing them is the key.



Source : Hideki Wakabayashi

Lessons from Taiwan

- Digital / IT
- Resilience
- Global mindset
- Education (practicality, originality)
- Information sharing
- Simplicity with substance (especially among the wealthy)
- Empowerment of women

— The Japanese spirit that we are beginning to forget.

青出於藍而勝於藍　吾等當互相學習, 有時為師, 有時為弟, 共同成長

Let us learn from one another — at times as teachers, at times as students — and grow together.