

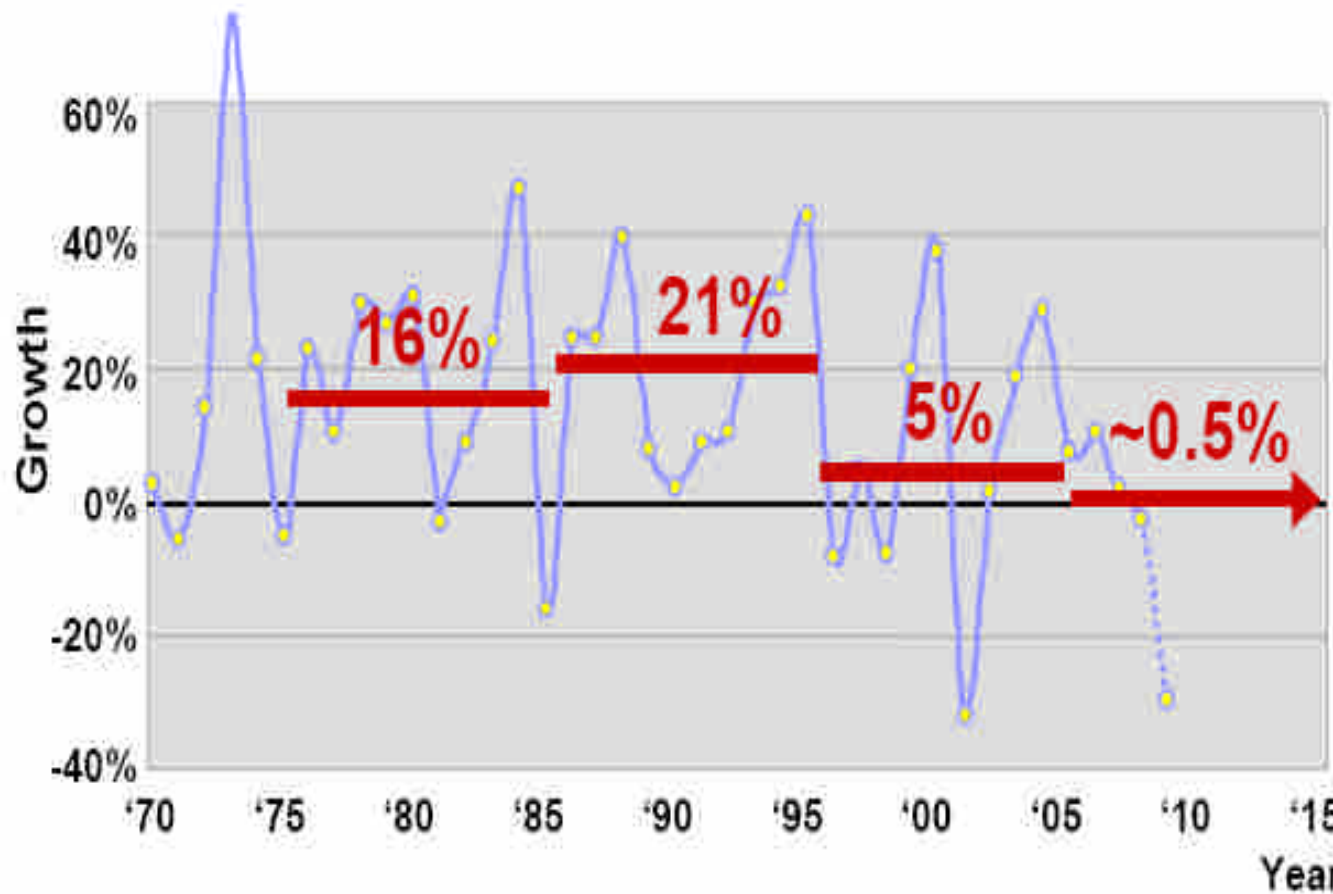
Collaborative Innovation of EDA, Design, and Manufacturing

Jyuo-Min Shyu
National Tsing Hua University
Taiwan, ROC
2009/7/8



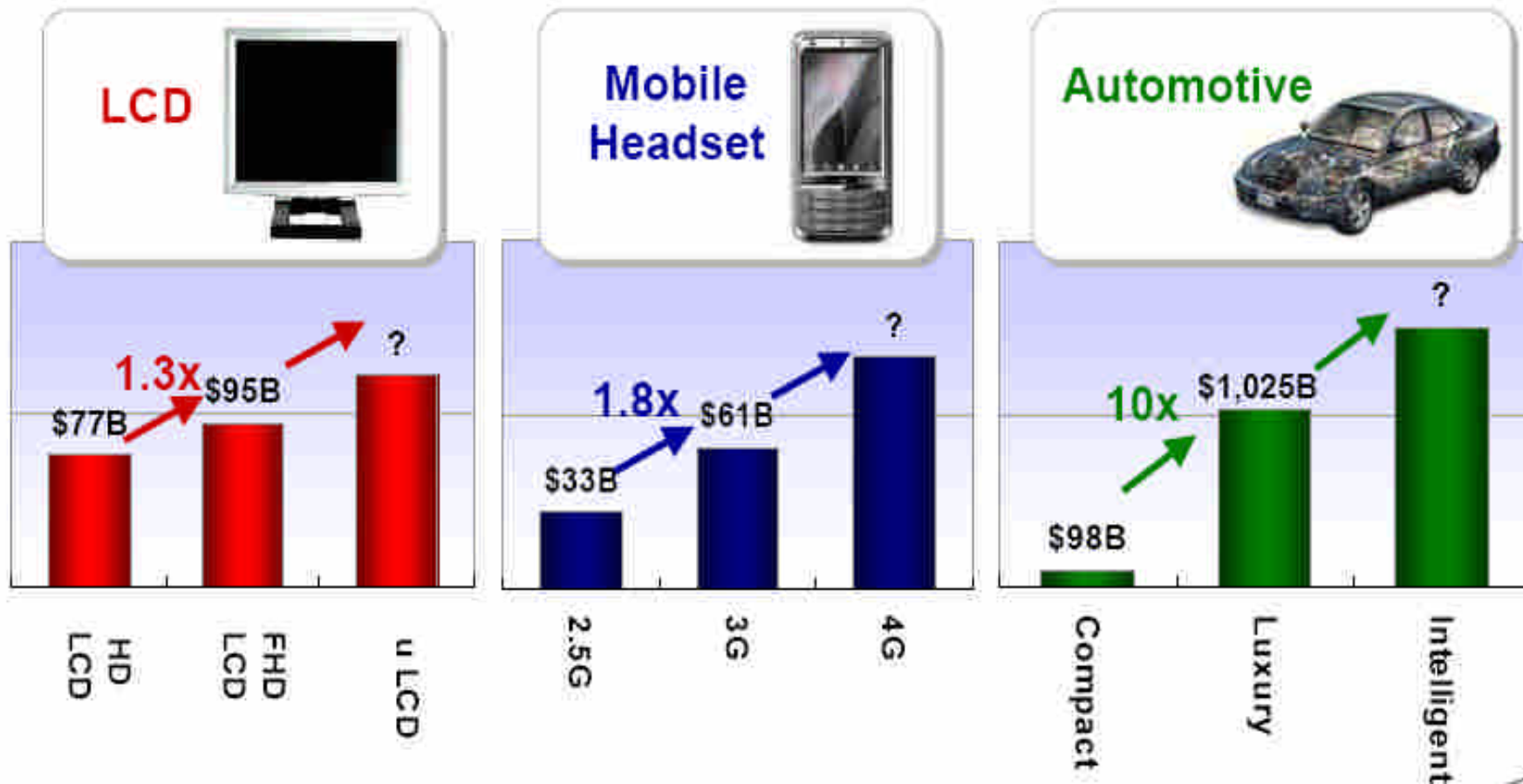
國立清華大學
National Tsing Hua University

Semiconductor Market Facing Difficult Times



| Year | Growth |
|------|--------|
| '02 | +1% |
| '03 | +18% |
| '04 | +28% |
| '05 | +7% |
| '06 | +9% |
| '07 | +3% |
| '08 | -3% |
| '09E | -30% |

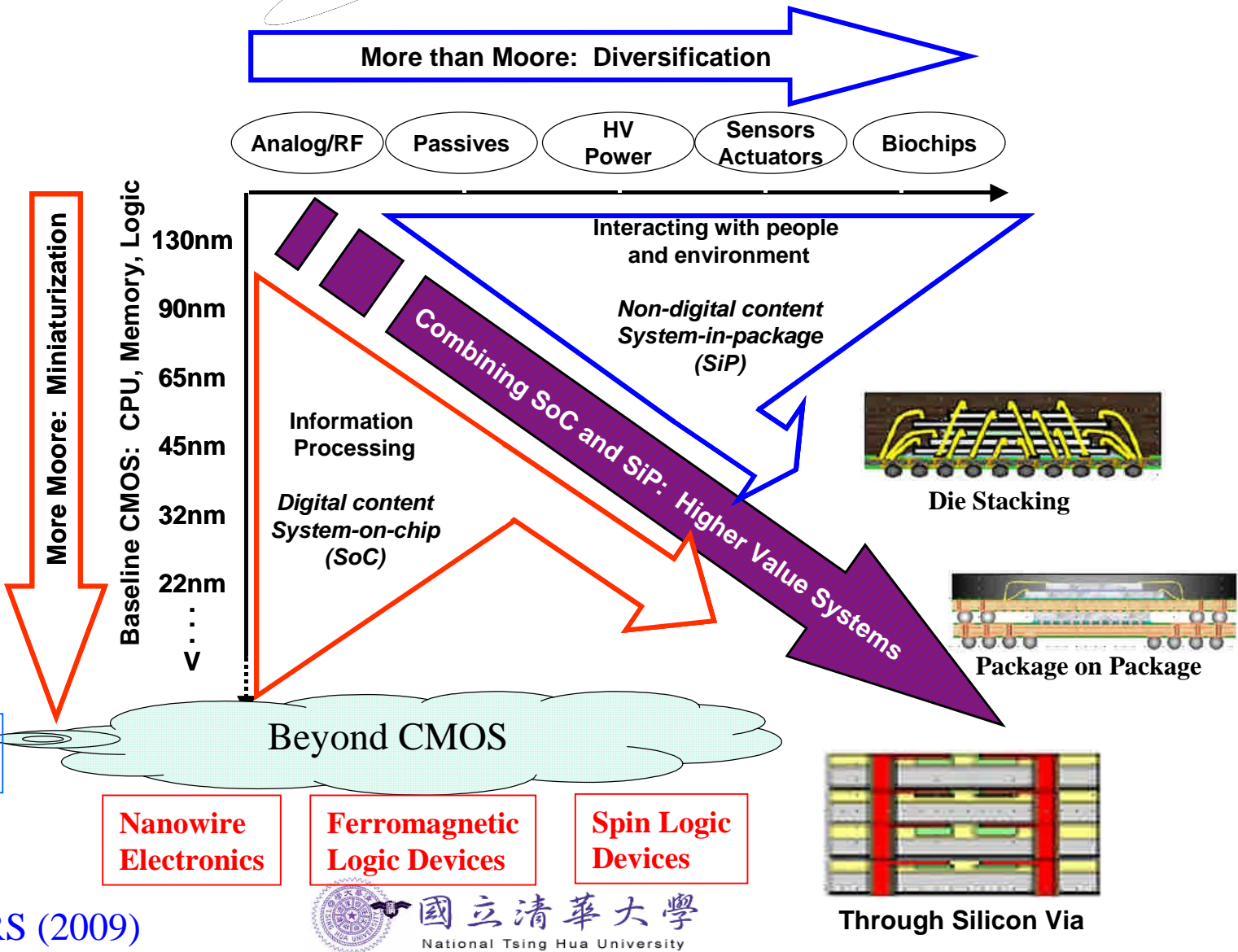
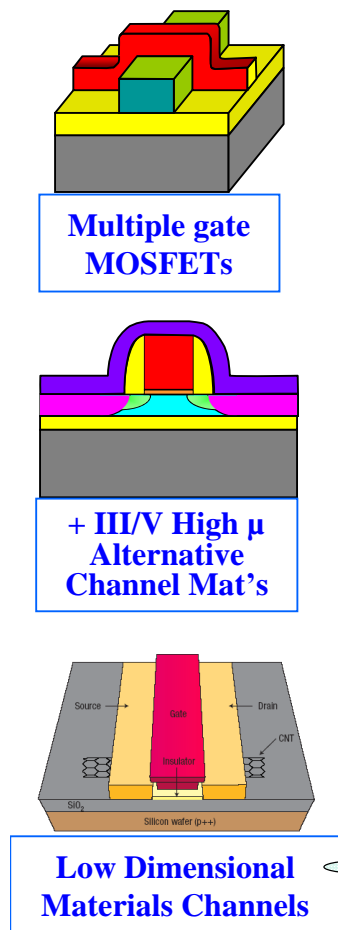
But...More Silicon Identified in Future Products!



Source: Gartner, iSuppli, Strategy Analytics (2009)



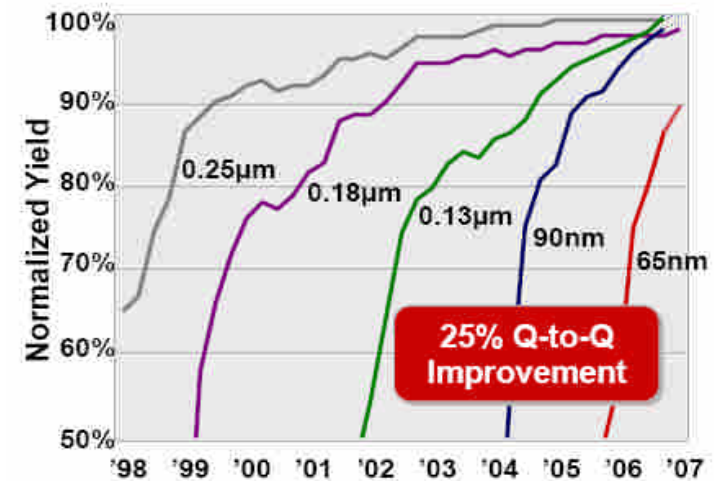
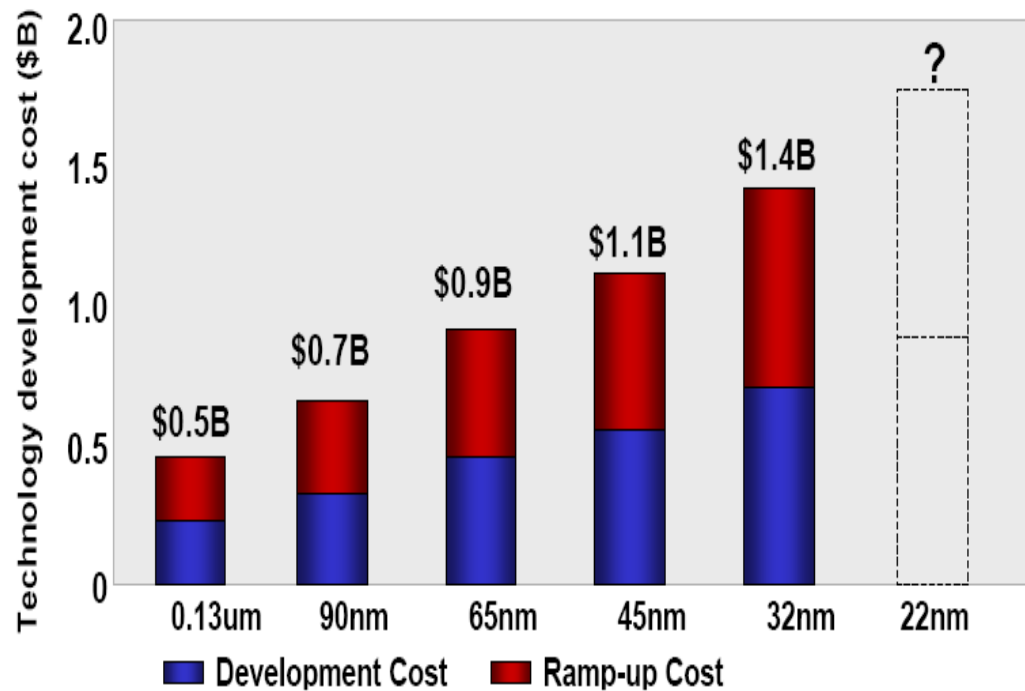
R&D Under “Moore’s Law & More”



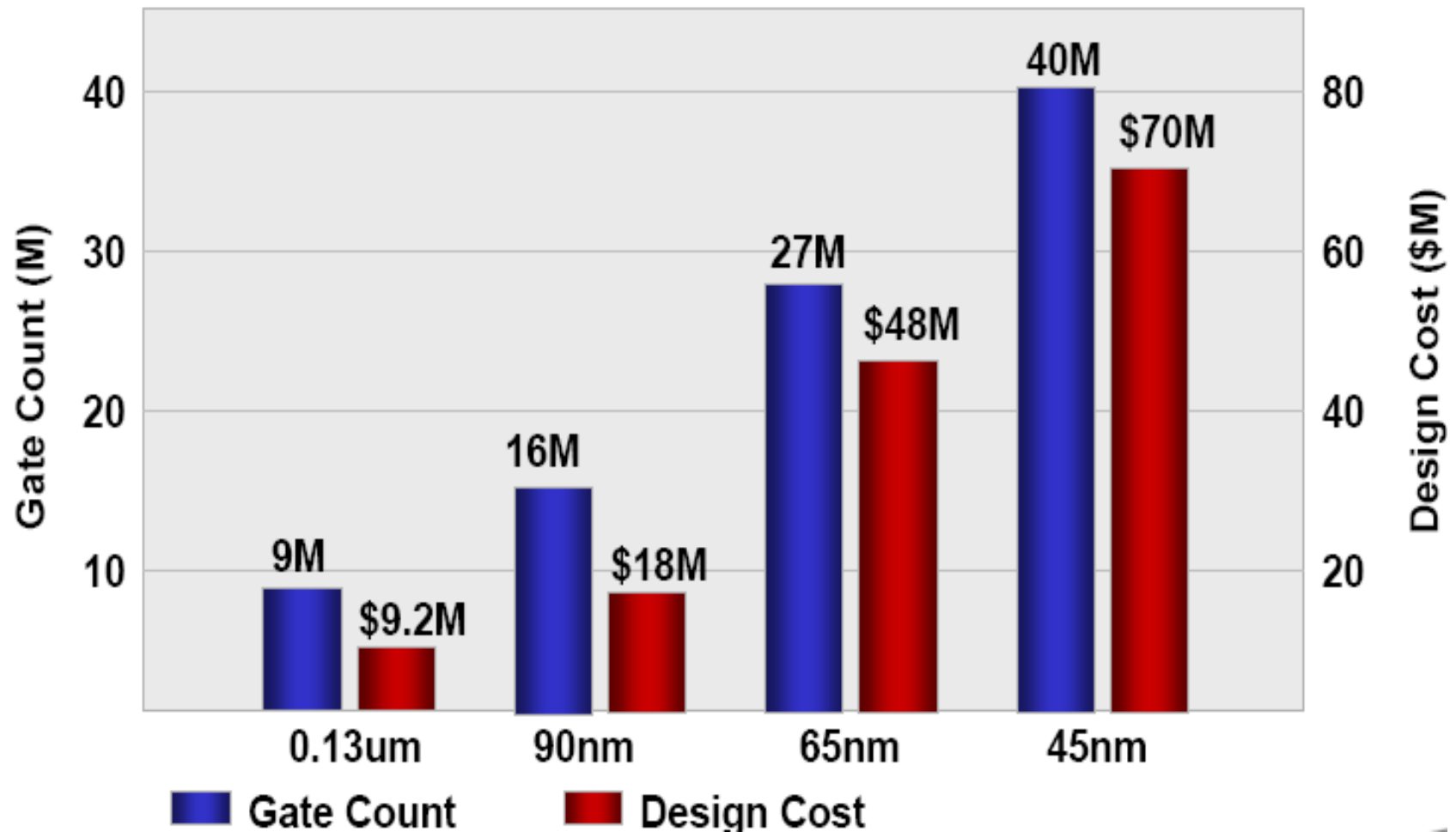
Source: ITRS (2009)

Process Technology R&D

Financial threshold getting higher

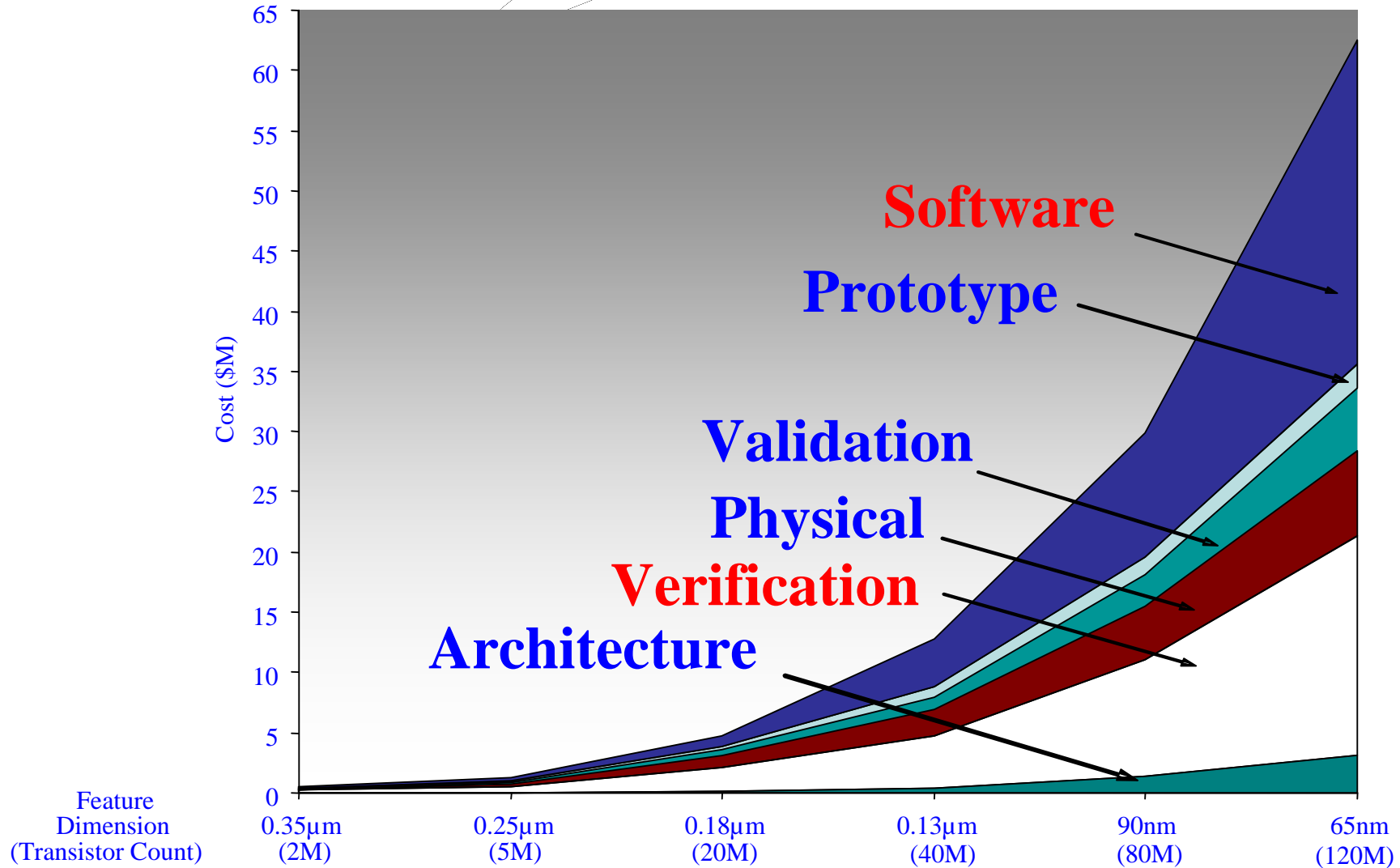


System Chip Design



Source: Global Unichip (2009)

Expensive Design Leadership



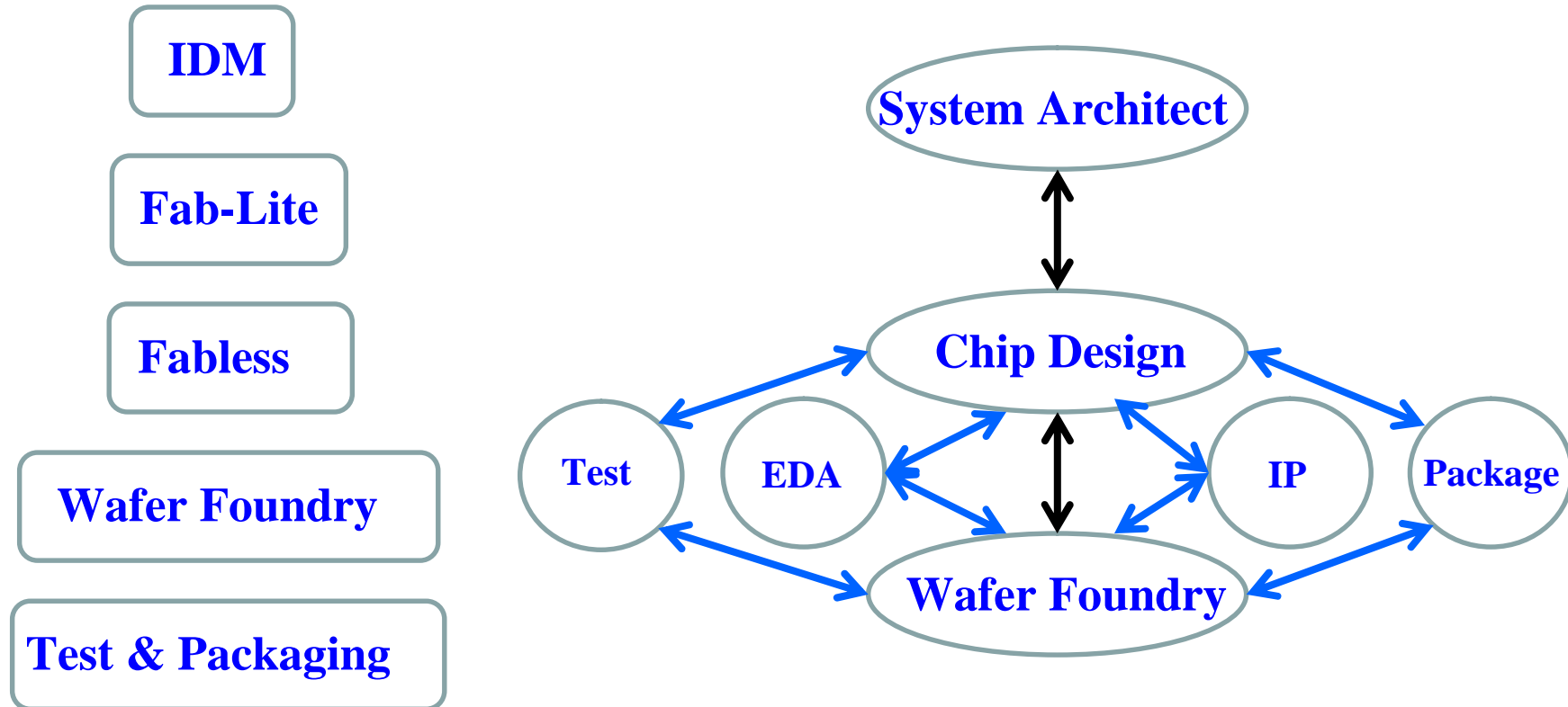
Technology Alliance as One Solution

IMEC



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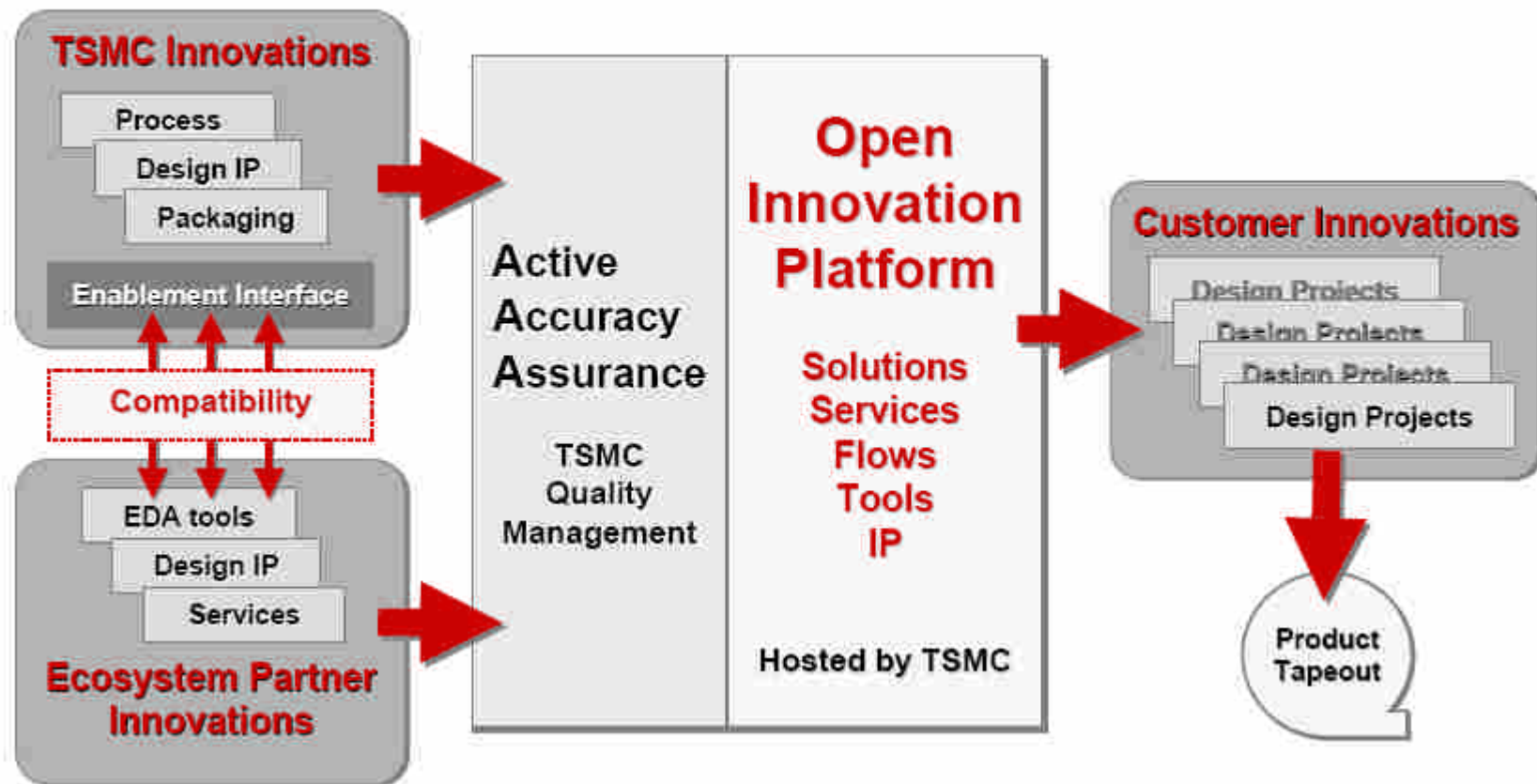
Paradigm Shift for Contract Manufacturing



Sufficient revenue (~ 5B USD) required to support research and manufacturing investments

A Foundry's Collaboration Model (tsmc)

Open Innovation Platform™



Growing Concerns

- **Technology Leadership**
 - **Logic: Intel; Memory: Samsung**
 - **Foundry technology offering behind Moore's Law**
 - **High cost for fabless to adopt leading edge technology**
- **Skyrocketing cost for advanced litho & uncertain roadmap**
 - **Hardware suppliers hesitate toward 450mm infrastructure**
- **Market dominated by tool vendors and manufacturing service**
- **University labs: limited process technology researches**
- **Constrained university-industry collaboration: IP concerns**
- **Imbalanced university researches between process/device & design/EDA**

Collaboration for Industry's Total Innovation

- **Innovative collaboration models to share R&D cost**
- **Government plays a crucial role**
 - **Initiate and support “national R&D programs” to help regional industries**
 - **Encourage international/industrial collaborations to leverage global research network**
- **Topics for EDA research (computation intensive)**
 - **Manufacturing: yield ramp-up**
 - **3D-IC: modeling, design, manufacturability**
 - **Multicore SoC: software quality and design productivity**
 - **Energy efficiency: generation, distribution, consumption**
 - ...

Example “National R&D Drives” (Taiwan)

- **Telecom (since 1998): ~ US\$ 70M/yr**
 - Wireless, Broadband Internet, Telecom Services, ...
- **SoC (since 2001): ~ US\$ 70M/yr**
 - IC (RF, Mixed-Signal, DSP), Embedded S/W, EDA
- **Nanotechnology (since 2003): ~ US\$ 100M/yr**
 - Nano-materials and nano-fabrications
 - For applications in semiconductors, optoelectronics, bio-medical, energy, ...

International & industrial collaborations are highly encouraged and supported in university programs!

Conclusion

- **Semiconductor industry is facing historical challenges**
- **Need innovative collaboration model to share R&D cost**
- **Government role is crucial**
 - **Initiate and support national R&D drives**
 - **Encourage and support university programs for international and industrial collaborations**

