

How Japan Lost its Semiconductor Industry



Strategic Causes Behind the Long-Term Failure of Japan's Semiconductor Industry

- Success Leads to Arrogance
- Missing the Demand Driver
- Wrong Manufacturing Strategy
- Finance and Exchange Rates
- Competitor's Strategies

Maxim: You don't win a market, you lose it.
Business is a game of faults.

Success Leads to Arrogance

- Japan's Successes of the 80's Lead to Arrogance
- Executives started to believe:
 - There was an historic spin of wealth around the globe that had gone from China to Europe, then America, and was now coming to Japan
 - There was nothing new to learn from the West
 - English, the language of business, was no longer relevant to their success
 - These beliefs set them up for failure
 - *No need to work hard, learn, or understand*

Missing the Demand Driver

- The “Olympic Rule” of NEC’s Ogi-san
 - Japan had always leapt ahead with each new Olympics, so it would in 1992
 - But, each leap was predicated on innovative Japanese products: the VCR, Trinitron TV, etc
 - For 1992, only HDTV was in the queue
 - But they cost upwards of \$40K each
 - making them unaffordable
 - there was no demand driver
 - But Japan’s Semiconductor producers began a heavy capacity expansion with 6 inch fabs in 1991
 - This would leave them unable to build 8 inch fabs in 1993
 - Korea waited for 8 inch putting Japan at a fundamental cost disadvantage

Wrong Manufacturing Strategy

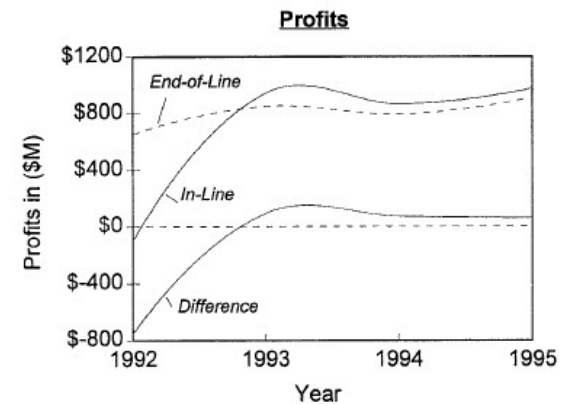
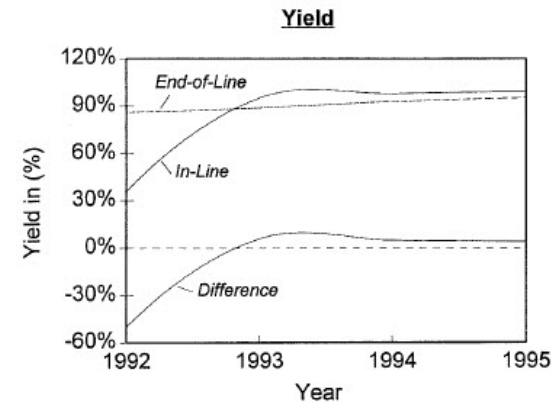
- Choice of Ultra-Clean over Yield Management in the early-90's
 - Two directions for improving yield
 - Dr. Ohmi's strategy of building the cleanest, or "Ultra-Clean," clean room possible
 - KLA's Richard Hong* development of in-line monitoring in Korea, which became known as "Yield Management"
 - Hong was right and Ohmi was wrong

* Richard Hong won SEMI's Bob Graham Award in 2008 for this

Ultra-Clean versus Yield Management

- Korean chip makers using yield management techniques passed Japan by 1993 and held that advantage
- Higher yields combined with lower cost-per-area due to 8 inch wafers gave Korea a fundamental cost advantage

In-Line vs. End-of-Line Inspection
(results from 2 4Mb DRAM producers †)



Source: VLSI RESEARCH INC
85009

† Data has been normalized to 5000, 200mm WSW line.

Finance and Exchange Rates

- Early 80's Bonds came due in Early 90's
 - Japan's DRAM makers had funded DRAM expansion with bonds
 - As these came due, Japan was struggling with the profitability needed to pay them back
 - Japan's banks went into their own crisis
 - Japan's chip makers were reluctant to go outside their keiretsu banks for funds
 - This further constrained capital expansion
- Combined with a strengthening of the yen
 - 245 yen/dollar average from 1975-1985
 - 119 yen/dollar average from 1990-1995
- Japan's chip makers were climbing a financial cliff
 - As Korea's rode a water slide down

Competitor's Strategies

- American Strategy to undermine Japan's profitability via Korea
- TRON a new microprocessor architecture
 - By 1990 Japan was dominant in DRAMs
 - They then planned a move into Logic
- American companies saw the above strategic issues Japan faced
 - They countered by 'gifting' technology and support to Korea
 - Korea would pressure Japan's profits and thus hamper their abilities in logic

Today

- Japan still faces an uphill financial battle
- It's held down by a new generation that is not comfortable in foreign languages
- But it has an excellent engineering force
- Toshiba has proven it can be competitive via its success in Flash memory
 - Renesas in SoC
- Elpida was close to succeeding

Lessons to Learn:

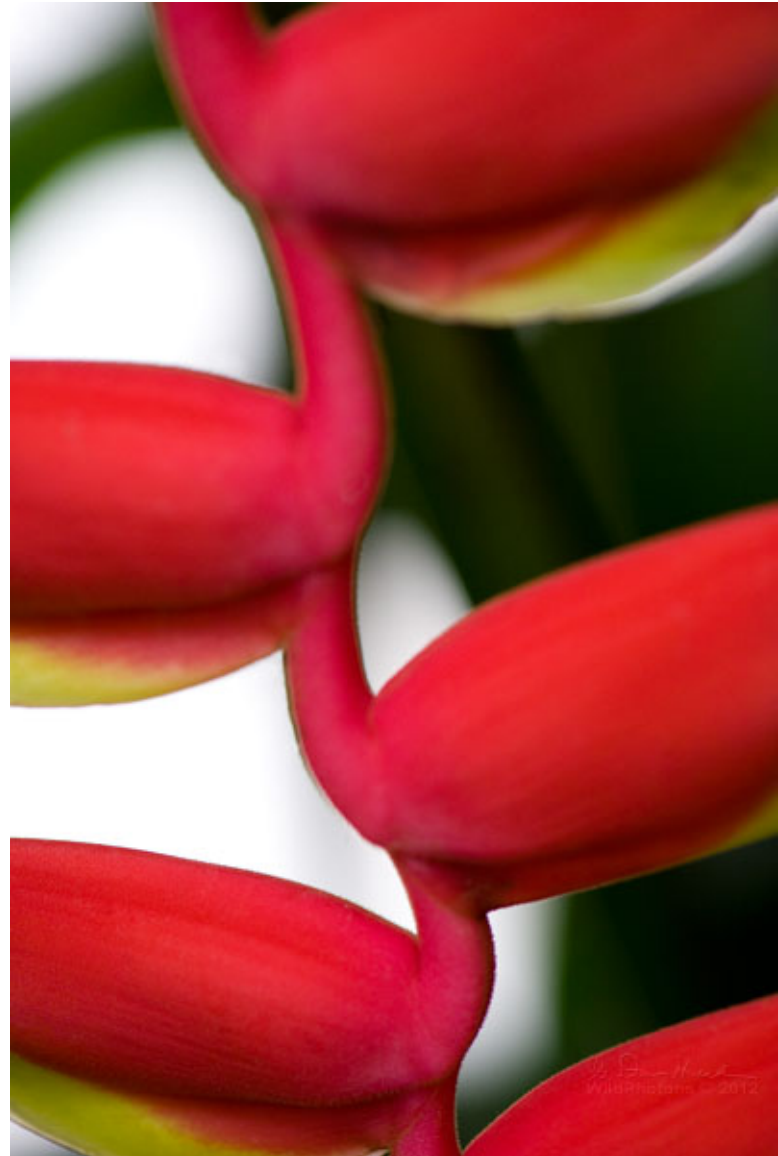
- Constantly reassess your positions
 - Only the paranoid survive
 - *Andy Grove*
 - A show does not come off the rails in a day. It is the cumulative of the many wrong turns.
 - *Peter Schneider*
- Don't over-commit to trend lines or beliefs
 - What you think you see may not be there at all
 - Look for the underlying driving forces
 - Your enemy is often yourself
- Don't be afraid to reverse decisions
 - Fail fast, then pivot
 - Failure is a process, not an obstacle
 - *Scott Adams*



Addiction to additions
results in inconsistency,
overload, or waste; and
sometimes all three

Mike Markkula

San Francisco Conservatory of Flowers
Why it Works: Colorful repeating
patterns. Reference number:
BA_11con_1004



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