

# The Future of Innovation: Implications of Today's Trends on Tomorrow's Technology

SEMICON West 2009

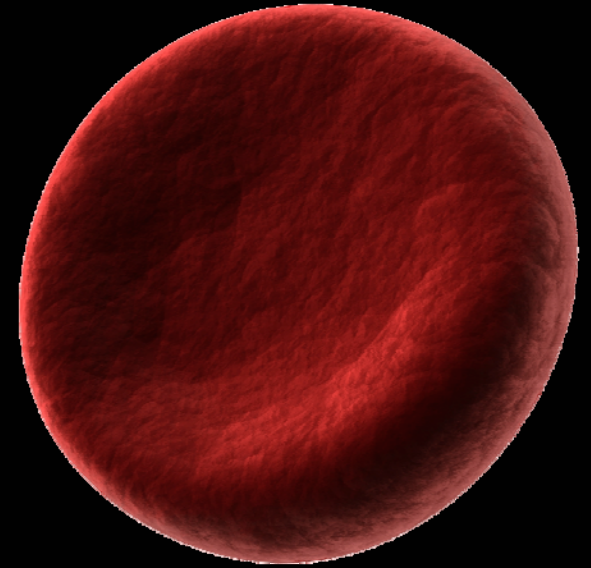
**Doug Neugold**

Chief Executive Officer & President

**ATMI**



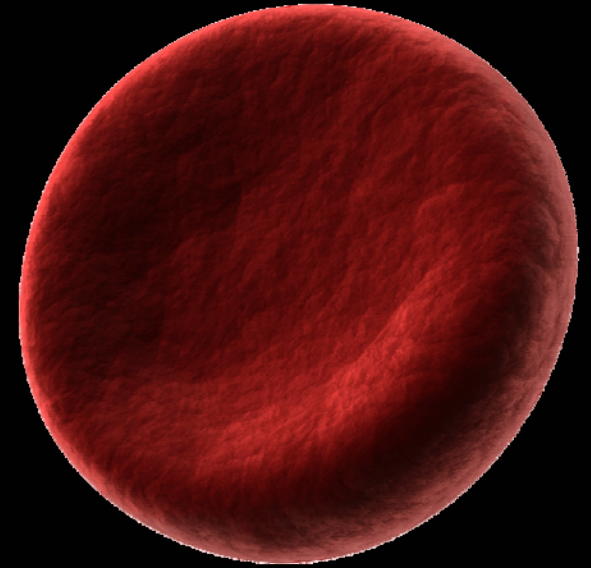
More than 300  
transistors can fit  
on a surface the  
size of a human  
blood cell.



SST "Fun Facts" about Intel's 45nm chips:

The original transistor built by Bell Labs in 1947 could fit in your hand, while hundreds of the 45nm transistors can fit on the surface of a single red blood cell.

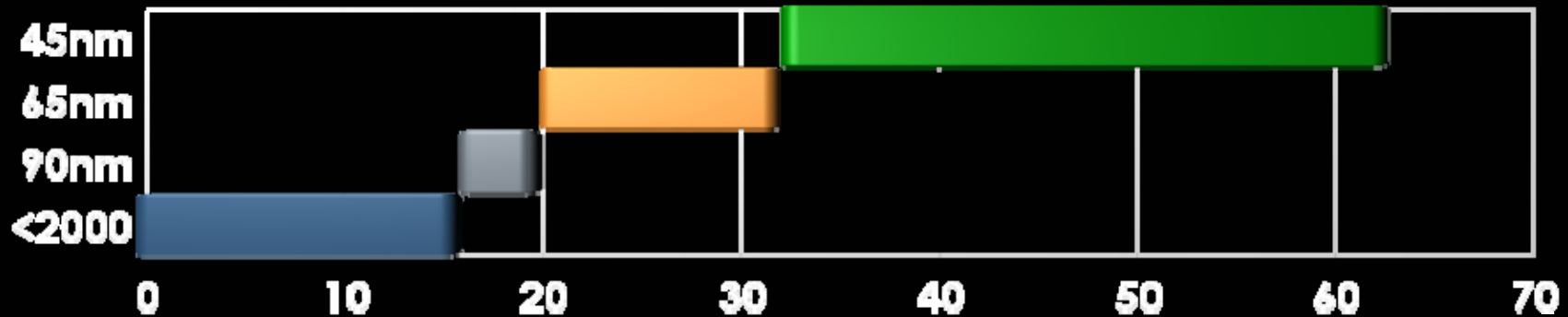
# This will happen on nearly every die attempted.



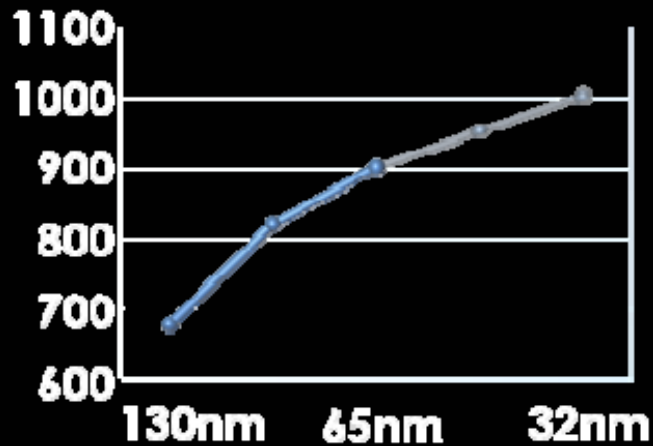
- Not some of the time.
- Not most of the time.
- Nearly all of the time (>97%).

# The Burden

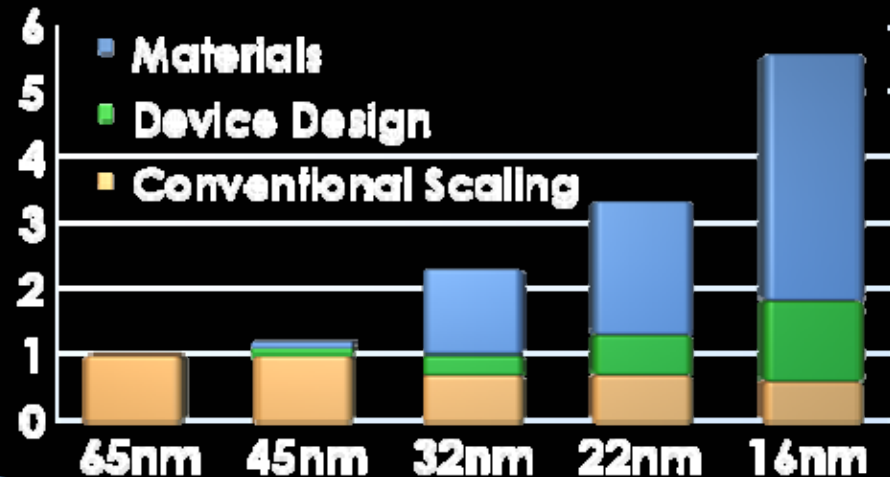
## Total Materials Required



## Logic Process Steps

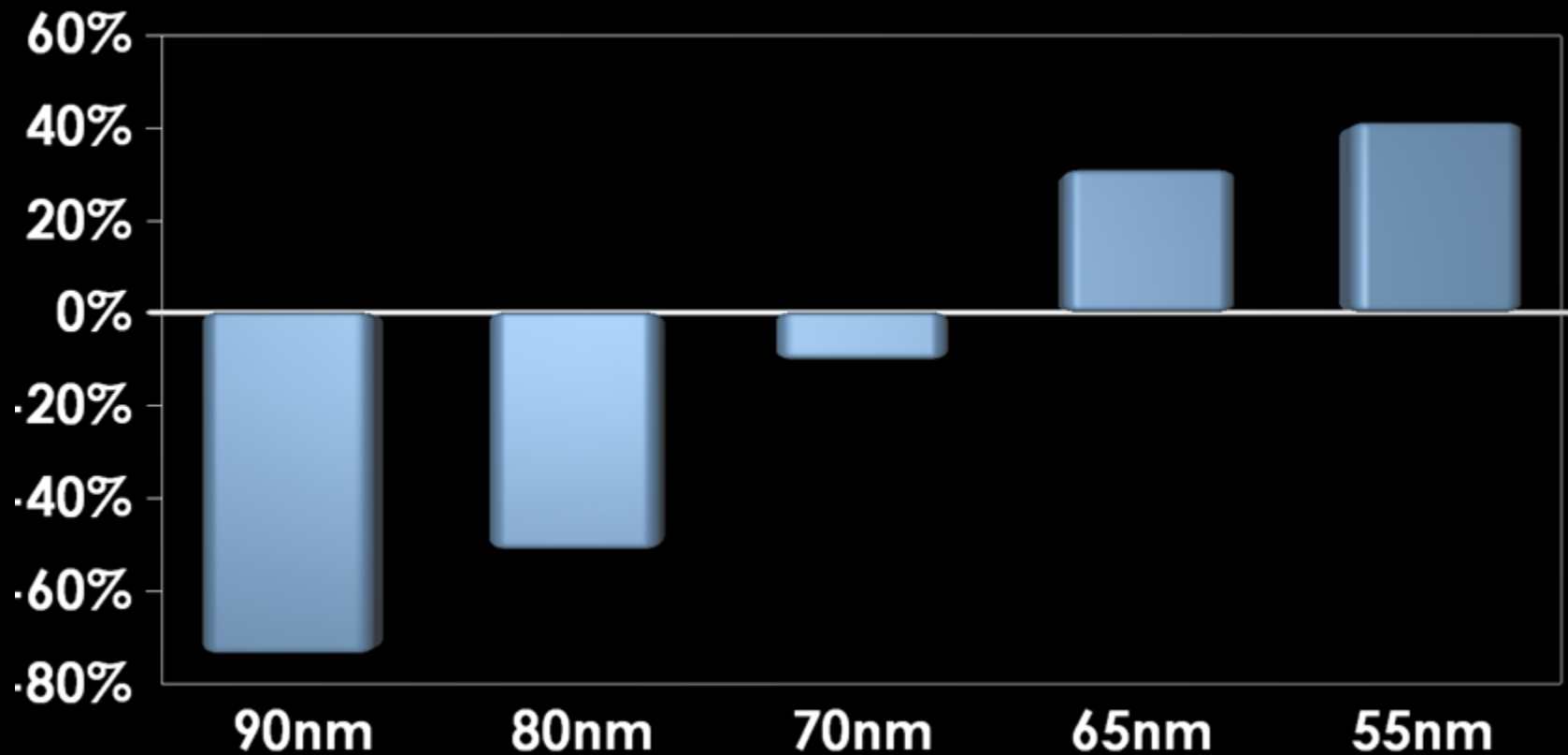


## Relative Gain in Performance



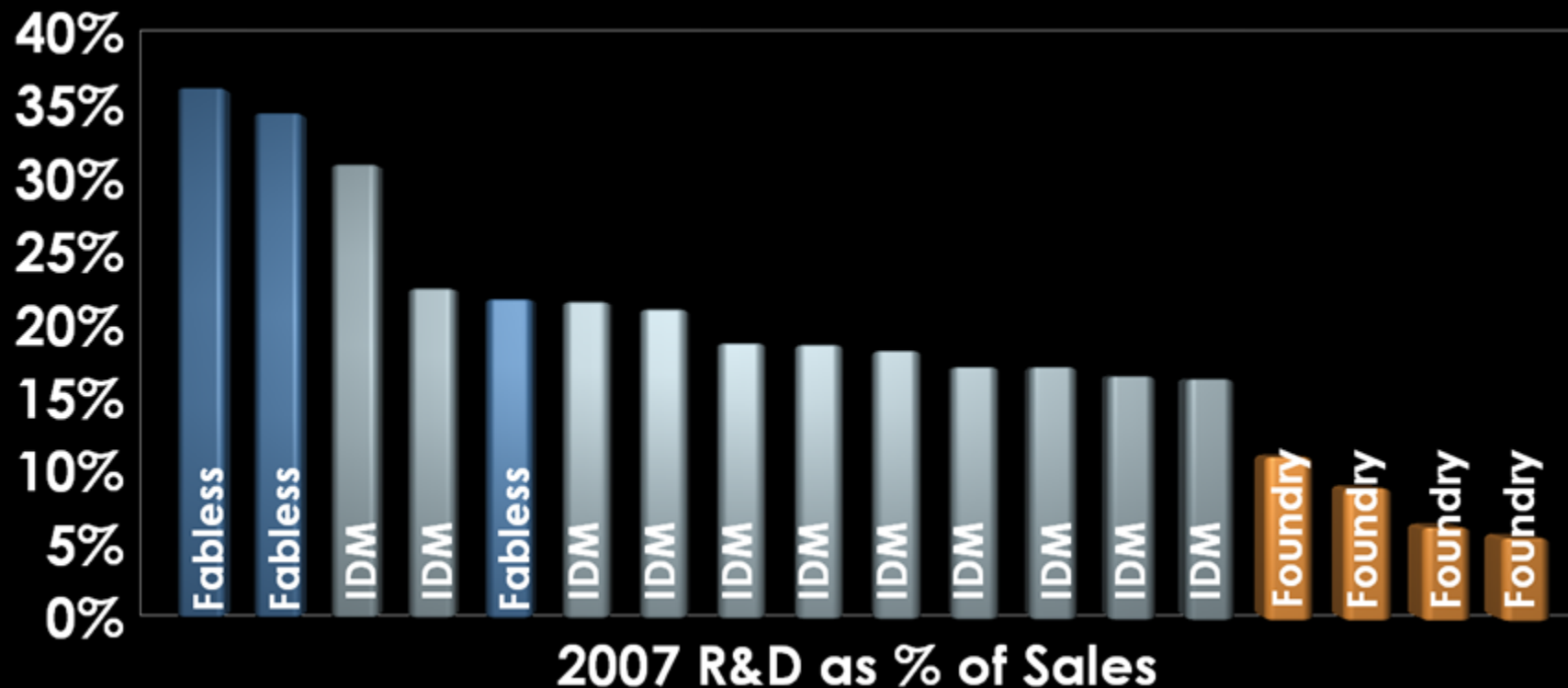
# Feature Size Defines Profitability

Gross Margin % for 1Gb DDR2 sold at 2008 ASP/Megabit



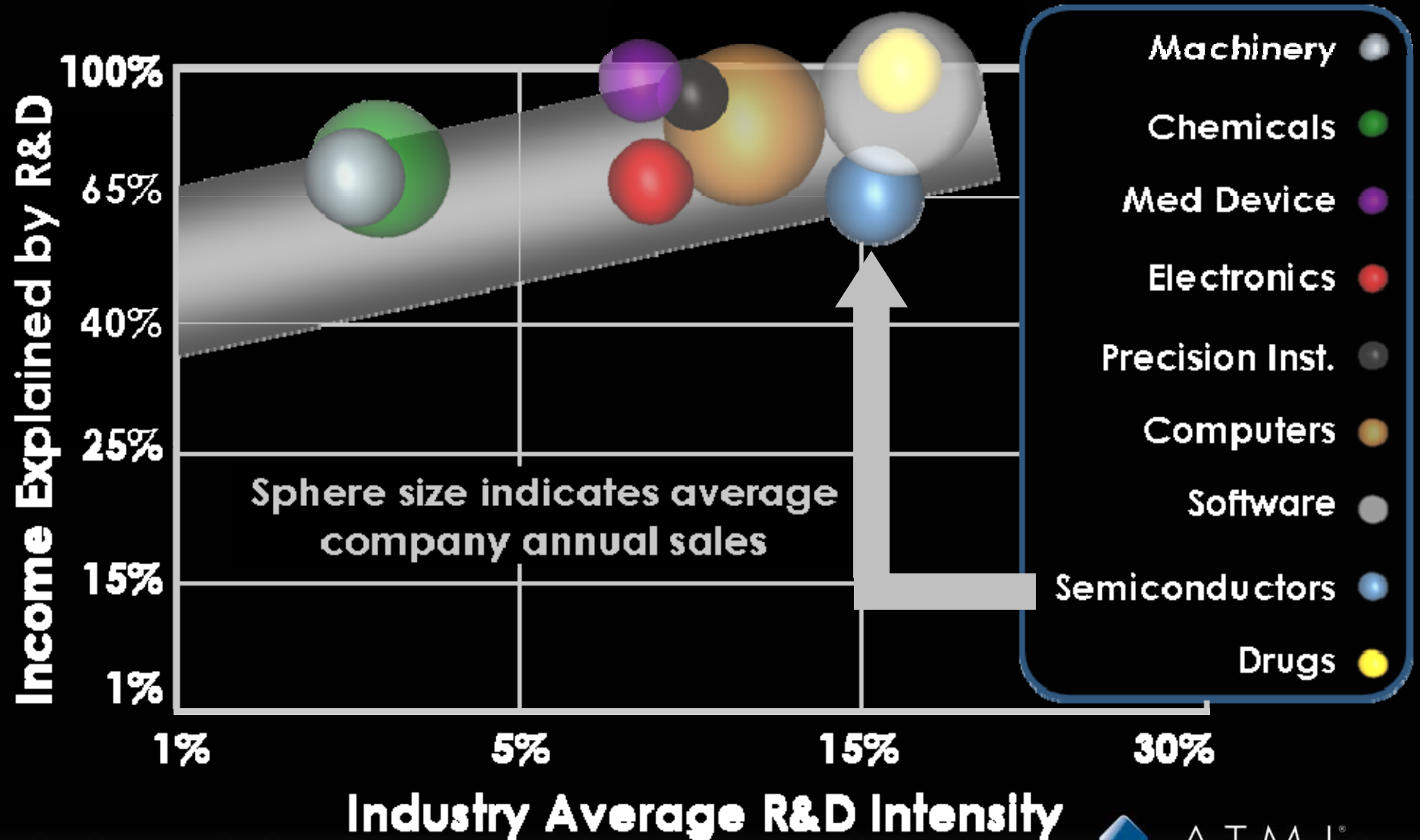


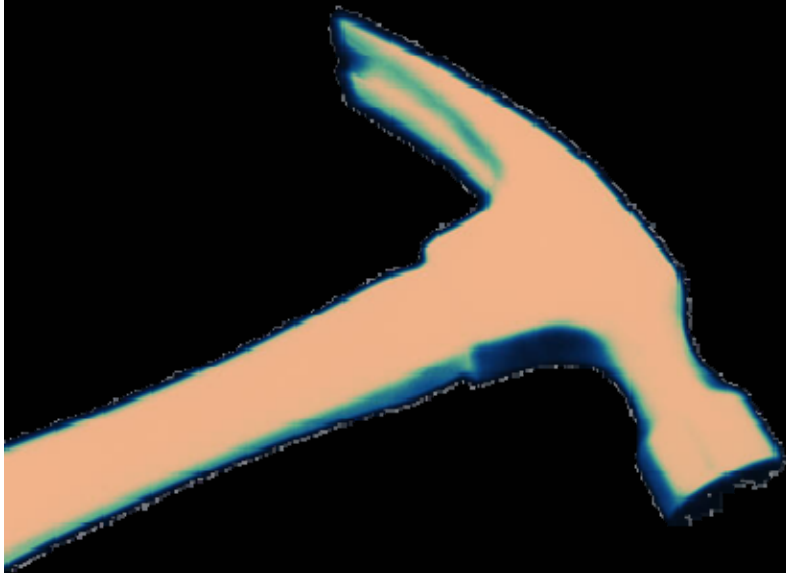
# R&D Spending Intensity



These research dollars are largely for product and process development (as opposed to pre-competitive research).

# Innovation Profit Curve





If the only tool you have is a  
hammer, you tend to see  
every problem as a nail.

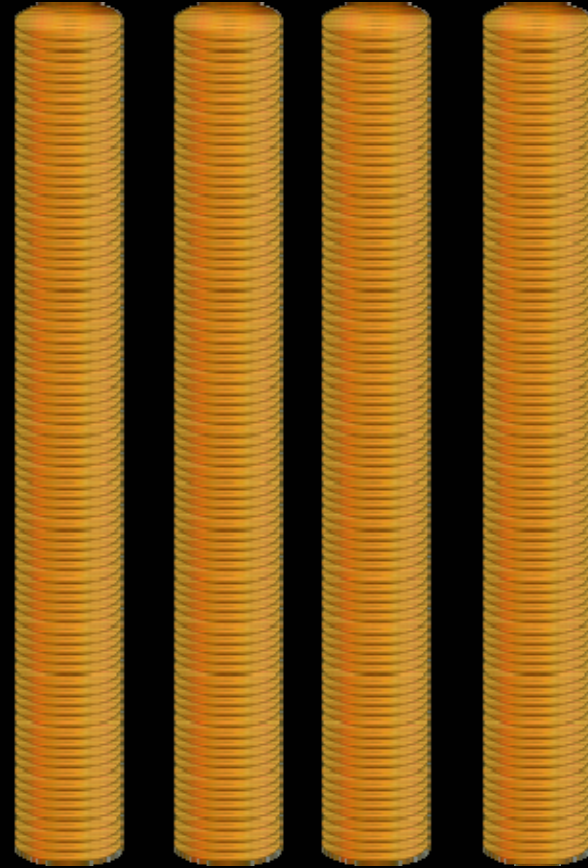
-Abraham Maslow, American Philosopher and Psychologist, 1908-1970



> Process  
Condition



> 100's of Test  
Wafers

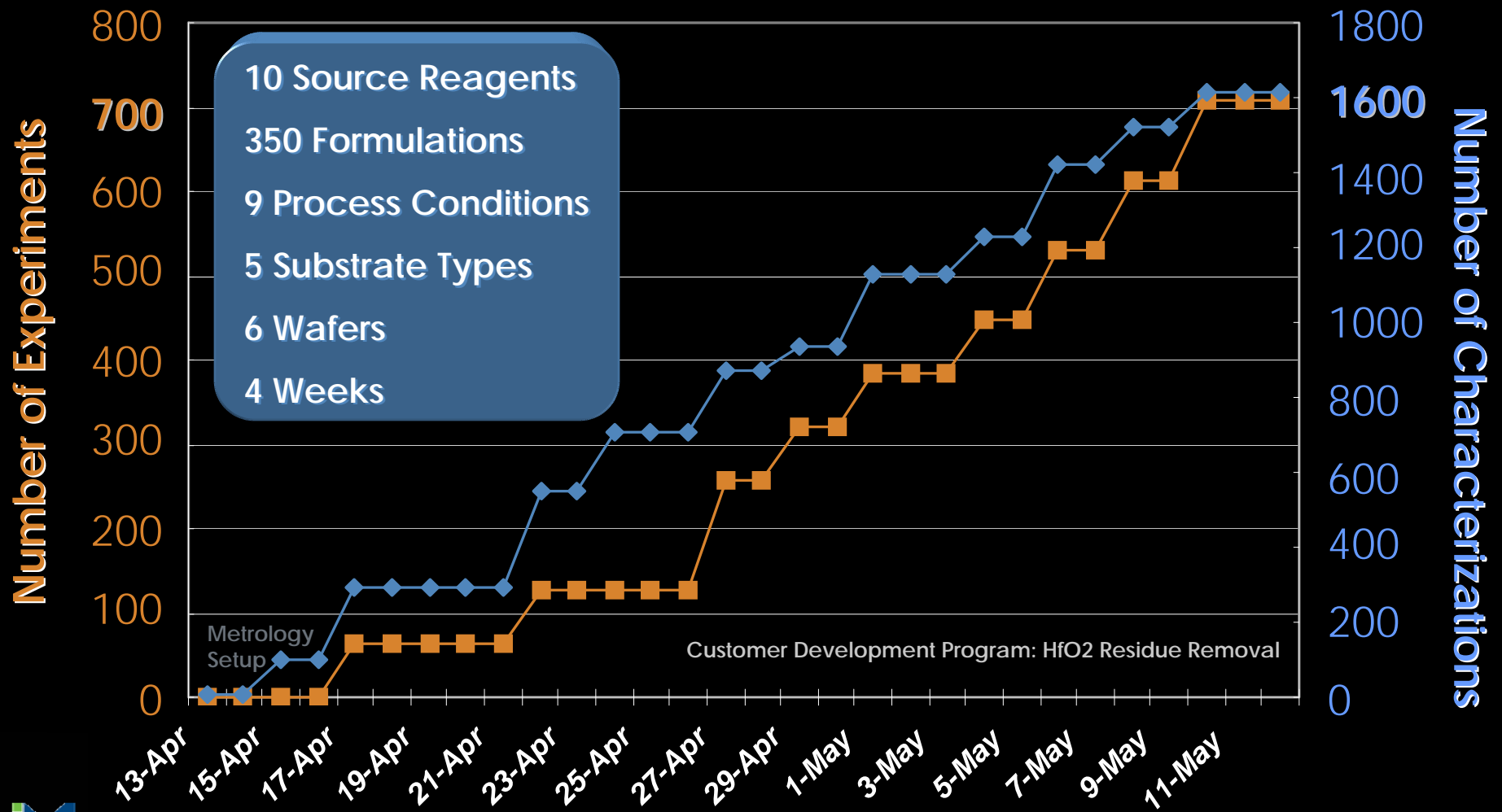




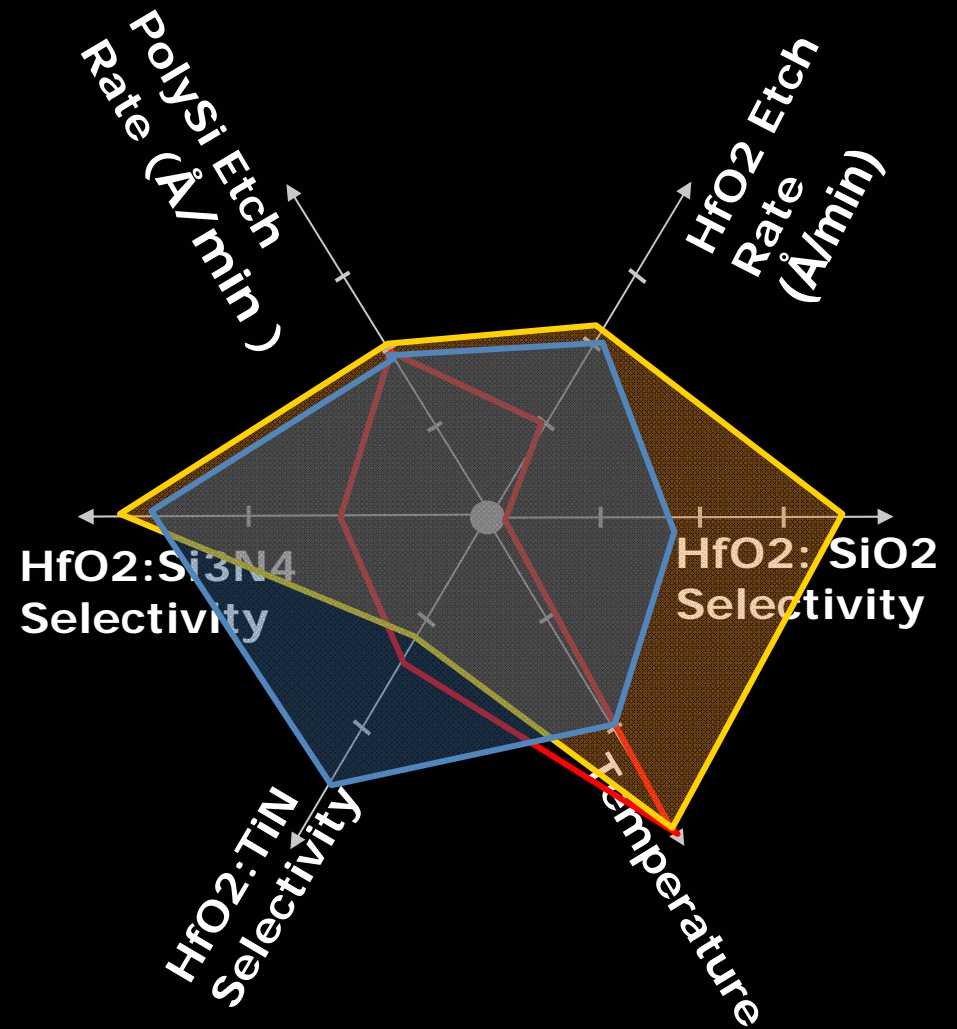
> 100's of Process Conditions

> 1 Test Wafer

# Huge gains in speed and efficiency drive a more informed decision



Efficiency allows for a more informed choice.



Example Customer Development Program:  
HfO<sub>2</sub> Residue Removal

# Summary Thoughts

- Increased process complexity is impacting R&D costs and return on capital
  - The historic approaches no longer work (we see evidence of this everywhere)
- Innovation is mandated, yet many customers drive their behaviors from a “cost down” perspective
- Add to that “cost shifting”, and you can nicely destroy your supply chain
- Demand innovation and reward it
- To get to the innovation:
  - Share more information and data up front and early
  - Be prepared to measure and reward value, in addition to cost
  - Collaborate with your suppliers to take advantage of their ability and investments to help you get better answers
  - Think about and test novel approaches, and help define with suppliers what will be needed to allow them to rethink process development and integration confidently



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