

# More than Moore or More Moore: a SWOT Analysis

G. Dan Hutcheson

*VLSI Research Inc.*

## ABSTRACT

Over the last decade, the world of semiconductors has broadened its horizon from More Moore to More than Moore. Some first hypothesized the end of Moore's law and the beginning of a new era. They saw it as an OR gate while some saw it as a NOR gate. Since then it has been an AND gate as Moore's law has continued to move down its persistent scaling path. Even if it fades, i.e. the end of More Moore, both will technologies will flourish. The reason is that More than Moore is complementary to More Moore semiconductor technology. More than Moore is largely made up of MEMS, which integrate microelectronics with micromechanical structures. Some include 3D packaging, LEDs, and Photovoltaic cells into the mix. In the future there are NEMS, or Nano-Electrical-Mechanical-Systems. In all cases the use manufacturing methods and metrology evolved from semiconductors. Metrology is critical to all these technologies, because to make something, you must be able to measure it, and to do that you must be able to see it.

This presentation examines the Strengths, Weaknesses, Opportunities and Threats (SWOT) for both classical semiconductor markets and these emergent technologies. It delves into how their technologies are evolving and the economic impact of this evolution. It addresses such questions as:

- Is scaling measurably slowing?
- Are design costs getting too high?
- What are the critical factors for a Moore's Wall scenario?
- As chips become an ever big-player game, will there be enough research centers to support metrology development.
- How fragmented is the More than Moore Market?
- Who are the leading players?
- Will they cross the valley of death from MEMS to Bioelectronics?