MARKETS IN TIME

"All who have accomplished great things have had a great aim, have fixed their gaze on a goal which was high, one which sometimes seemed impossible"

Orison Swett Marden

(1850-1924)

INTRODUCTION

We work with established technology companies, either through Board service, or with the management teams on growth plans. A consistent theme that runs through this work is that these companies actively plan for and anticipate that their markets will evolve. This can take many forms, including cost reduction roadmaps, assumptions on price erosion, and feature set evolution. Another theme is that these companies typically understand the value of the business infrastructure, ongoing relationships with customers and of a functioning supply chain.

We also work with, and occasionally invest in, technology start-ups. While some of these companies are disciplined in considering the effect of time on their business, many get so busy working on their programs that they lose track of the industry they propose to enter. Cost points erode, technology entrance points shift. Many start-ups simply don't manage to profitably engage because they dramatically underestimate how much progress an industry can make while the start-up is in early development.

EXAMPLES THROUGH TIME

GAAS MICROPROCESSORS

Back in graduate school, everyone just knew that GaAs microprocessors were going to be the rage. The material had a higher bandgap, you could do cool things with thin layers, mobility numbers were good . . . .all of these things pointed to the obvious conclusion that the days of the silicon microprocessor were numbered.

Of course, silicon won.

It won because it had a big industry, with lots of smart women and men, pushing like mad to make these chips smaller, faster and cheaper. Stated differently, the competitive landscape simply changed so fast that an alternative technology could never economically enter. At this point in time, GaAs electronics is a small industry serving specific niche applications, with the silicon folks relentlessly making better products that encroach even upon these niches.

There are many examples of commercial forces eliminating good technologies, including technologies that may be superior on many levels.

Key Point: *The forces of the commercial market place often wipe out or ignore technologies with marginal differentiation.*

980 PUMP LASERS

Around 1995, SDL (now JDSU) and IBM Zurich (then Nortel, and later Bookham, now Oclaro) began serious commercialization of 980 nm pump lasers. In the early days, each 50 mW pump laser cost thousands of dollars. However, the two companies were quite competitive, rapidly driving up the output power of these products, and rapidly driving down the price.

This was an enormously attractive market, and companies around the world, including giants like Nortel, Alcatel, and Lucent, along with numerous smaller laser manufacturers, hopped into the game--developing their own lasers to try to compete.

Of course, SDL and IBM won.

Looking back at that time period, it is tempting to be nonchalant and say the folks at SDL and Zurich simply had larger brains or better work ethic. However, our take is different: we had production scale and were actively removing cost while simultaneously designing chips to constantly, and dramatically, increase output powers. (Well, ok, we were smart and worked quite hard, and our kids were above average, too . . .)

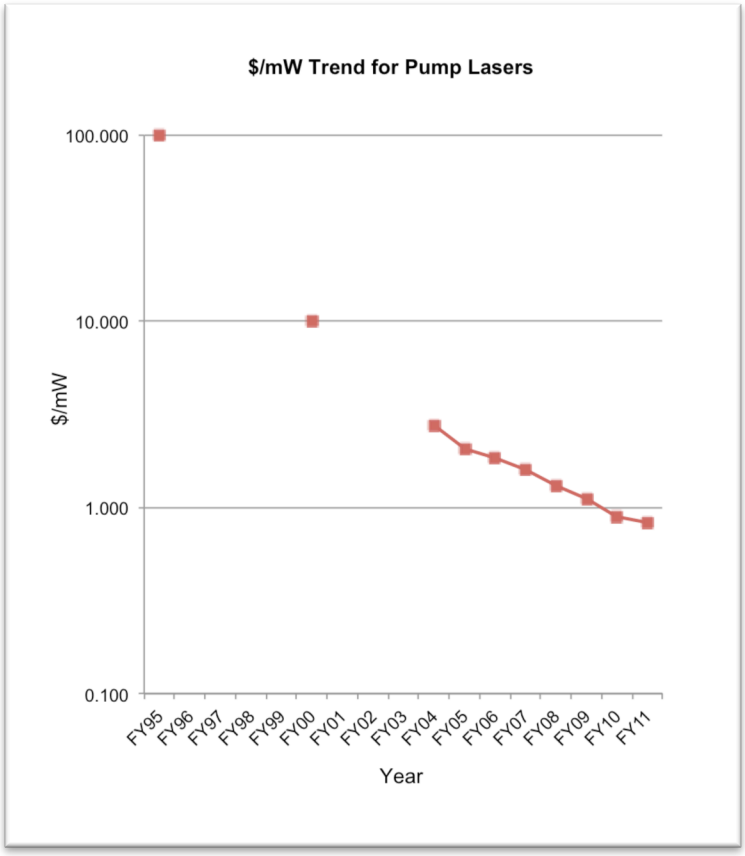

Figure 1 The trend of a key metric for pump lasers, $/mW, from 1995 to 2011. The data from 2004-2011 is provided courtesy of JDSU.

To understand how quickly this market evolved in the early years, Figure 1 shows a key metric of the industry, the cost of a mW of pump power, or $/mW. The data of 1995 and 2000 are approximations. (The data of 2004-2011 has been graciously provided by Toby Strite and Alex Schoenfelder of JDSU.) In the timeframe when competitors were seeking to enter this market, pump pricing was falling by about 37% per annum, or 10% each and every quarter. This type of rapid price erosion was only made possible by the regular introduction of new chip generations, which constantly shifted the economics of the business. Early 980nm pump chips had output powers of ~50mW; by 2000 the output powers had increased about 400% to ~200mW. A decade later, output powers of nearly 700mW are now commercially available.

The people attempting to engage in the pump business were aware of the then current numbers, by and large, and were designing to enter the market with cost/performance points substantially better than the current market. However, as noted above, the leaders in this market were moving the price/performance points far faster than the development plans. As a result, companies attempting to enter the market consistently ended up chasing the flag.

Key point: *It is very difficult for a new entrant to enter a rapidly evolving market. The players internal to the market are benefiting from the education of intense production ramps.*

Key point: *It is critical that any new development program finish with a product or service that is differentiated and competitive at the time when the product finishes development.*

SOLAR CELL ECONOMICS

In the pump business, a single metric, $/mW, captured the economics of the industry. This isn't always the case. In some markets a model might need to incorporate multiple attributes. To illustrate this, we look at the solar cell market, where both the cost and performance of the solar cell are important attributes. The evolution of that market and the approximate interplay between these two metrics, is shown in Figure 2.

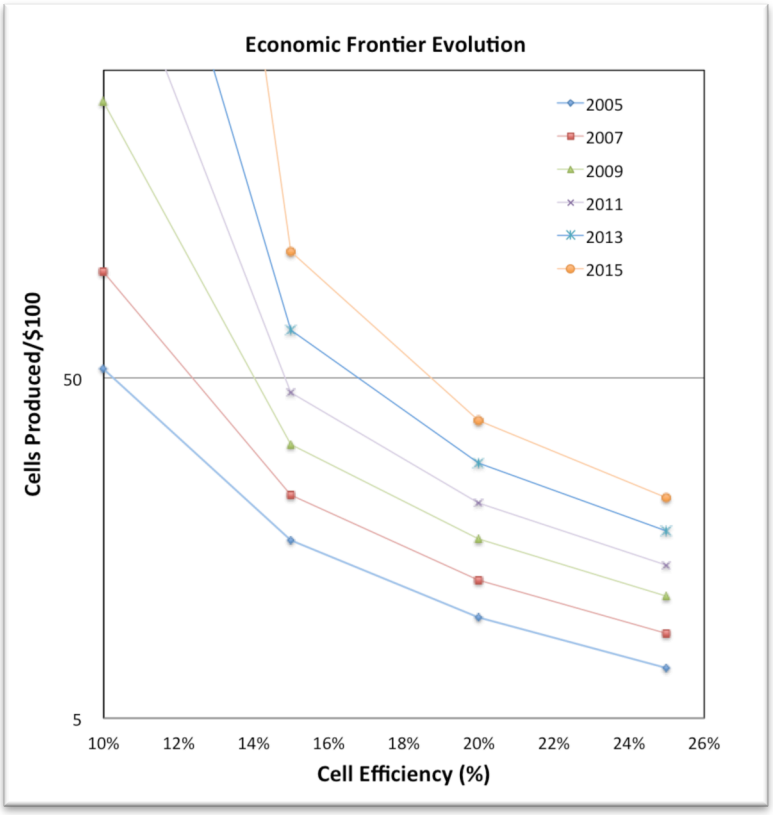

Figure 2 A two-dimensional representation of the development of both cost and efficiency in the solar cell industry. Each line represents a cost/efficiency curve that is industry competitive in a given year.

Within this figure, we show lines that represent equivalent economic value, including some accommodation for module costing and installation. In 2005, a cell with 10% efficiency

that cost about $2 to produce was competitive in the market and a cell with about 15% efficiency that cost about $4 to produce was roughly economically equivalent.

As both cell efficiencies and cost structure of the industry continued to evolve, this "economic frontier" kept moving up and to the right. By the year 2010, a cell that cost about $2 to produce needed to have efficiency more than 14% to be competitive in the marketplace! Interestingly that same 14% in the year 2014 will have essentially no economic value.

The continual improvement in both cost and performance of the cell means lower efficiency solar cells gradually become economically unviable over time.

Key point: *In some industries, multi-dimensional metrics are needed to adequately describe the landscape.*

Key point: *In the solar industry, the cost and efficiency of a solar cell has been evolving. This migration of the competitive landscape is making low efficiency solar cells irrelevant in the industry.*

SUMMARY

In many young companies the singular focus on internal technology development can result in losing external perspective and how it is evolving. It is important to consider the overall market and understand how it is changing; to constantly aim for product/service introductions that are strongly differentiated when the product is entering the market, not when the product development is started.

Best Wishes,

The InSite Team

