

There Be Dragons



What history can tell us about the future of the flat panel display industry at the The SID Business Conference at Display Week 2012 —David Barnes db@bizwitz.com

Sailing into uncharted waters, we may meet dragons for good or for ill

Dragons have positive and negative connotations. They can symbolize regeneration or destruction.

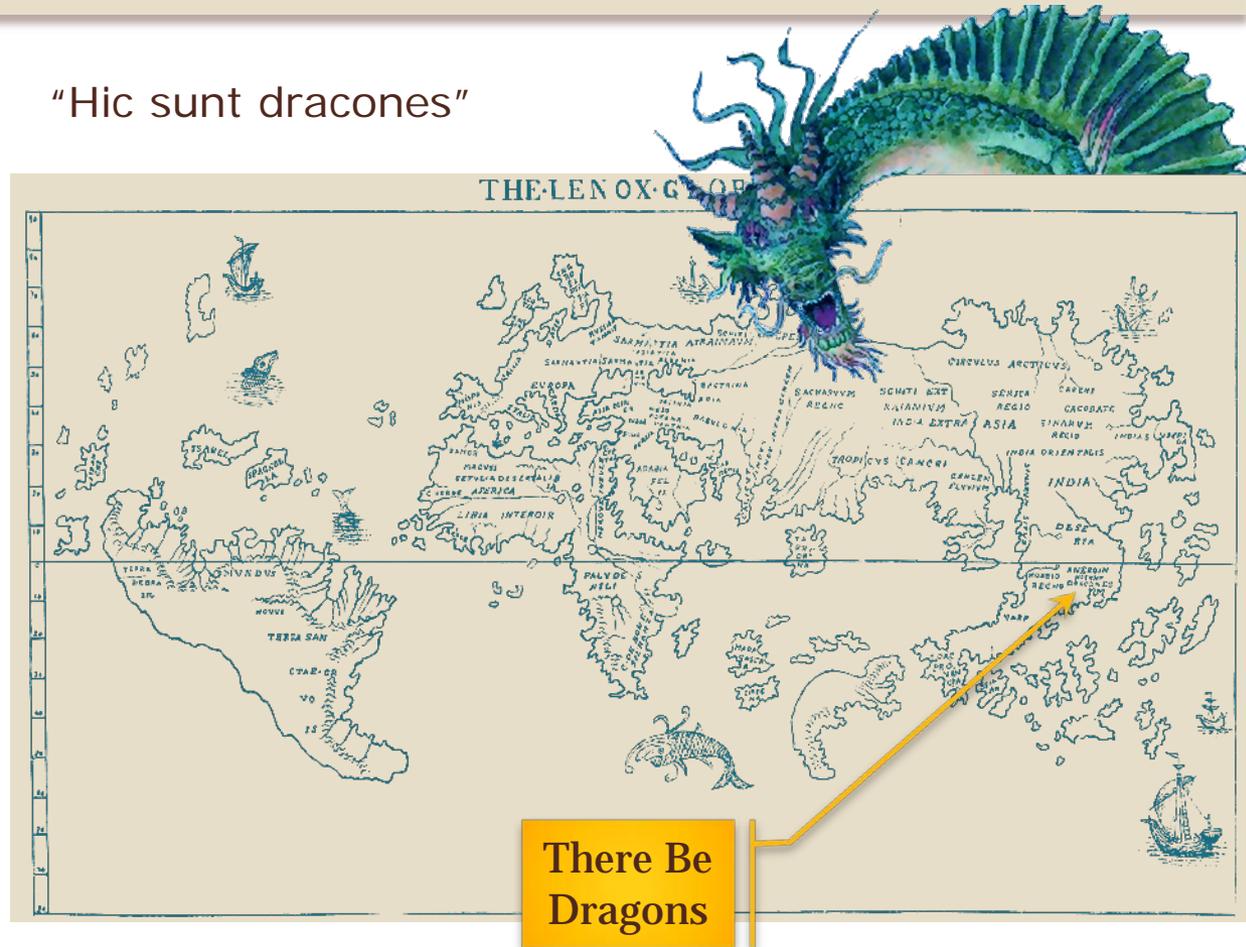
As we sail into the OLEO seas, what sort of dragons will we encounter?

Landing in a new place may allow some ventures to enjoy protected positions and to prosper.

Or, if too many ventures reach those same shores, none may enjoy better conditions.

This talk explores where we have been and where we may go in the next few years.

“Hic sunt dracones”



Source: Lennox Globe by de Costa, 1879 from a globe ca. 1510

TFT capacity this year is more than 20 times 2002's but it has been decelerating since 2009

The flat-panel display (FPD) industry spends about \$1M on capacity every hour.

As in Texas hold'em, the goal seems to be, "Raise the stakes until competitors fold."

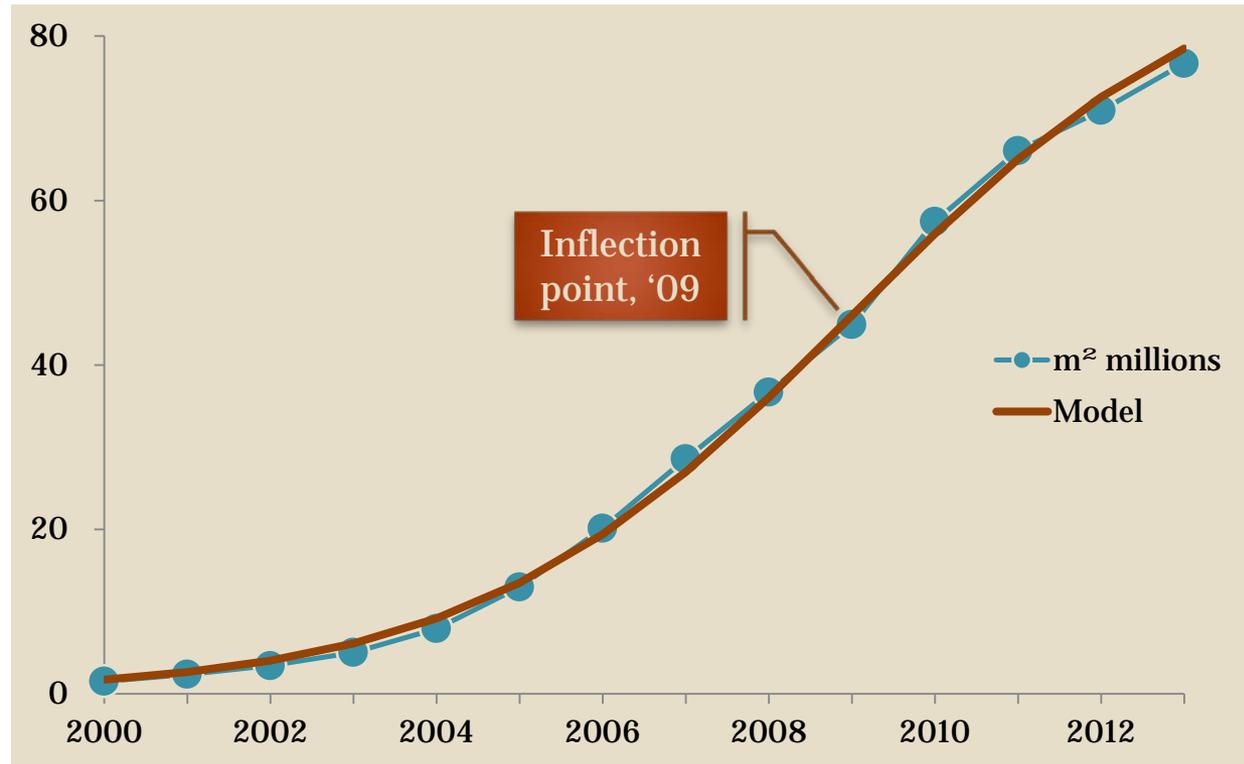
The nexus of investment moved from the USA (recall Kyles?) to Japan, then to Korea, Taiwan and China.

Each new nexus benefitted from national policies for development of high-tech employment and export...

until the point of diminishing returns.

Today Brazil and Russia look interested in hosting FPD.

TFT Area Capacity Development (millions m²)



DisplaySearch data, BizWitz analysis

While capacity growth has changed, price decay has not and it falls faster than cash-cost does

I hesitated to predict the area price of AMLCD would continue down its long term path during 2008-2010.

Macro-economic effects had so much influence, it was hard to see if micro-economic dynamics remained the same.

I can now say they have.

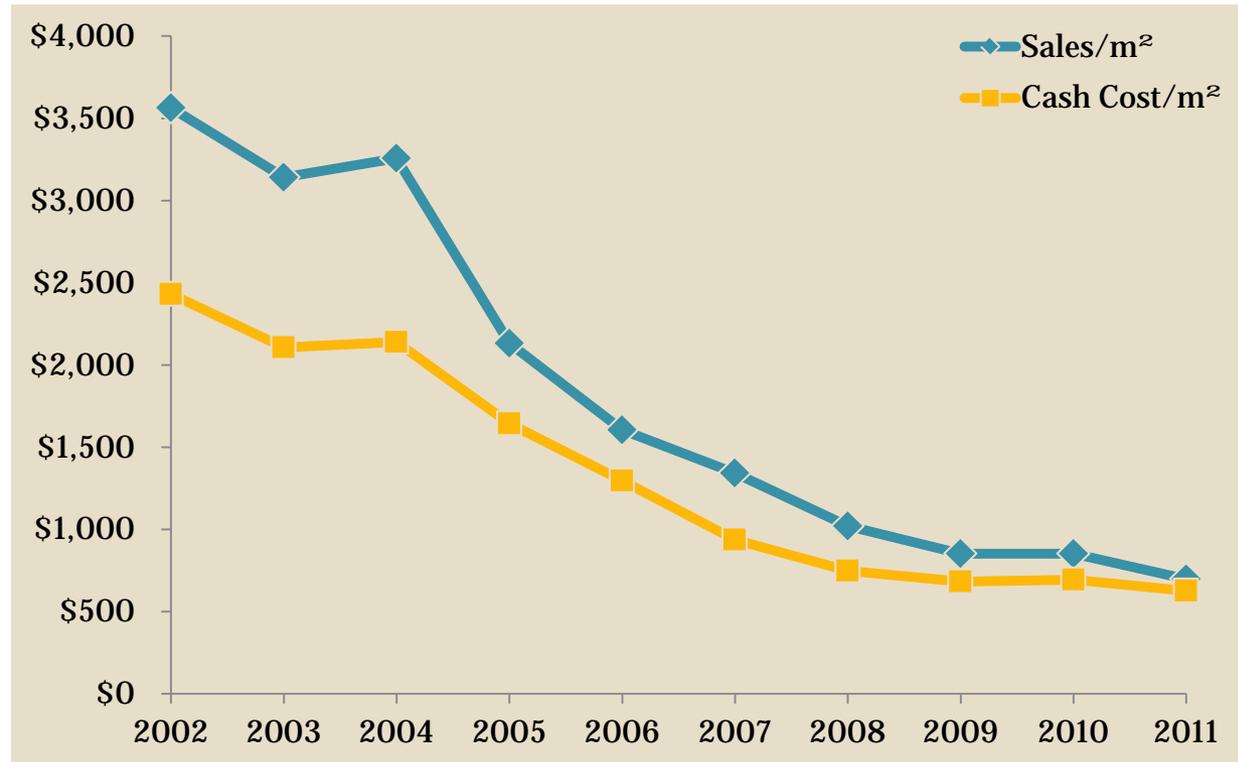
The annual pace of area price decline remains -19% .

More important, the annual pace of cash cost reduction remains about 17% .

Even leading AMLCD makers cannot afford typical levels of depreciation any longer.

They're sailing profitless seas.

Areal Price and Cash Cost Development (USD/m²)



Source: SEC-Edgar filings by AUO and LGD, BizWitz analysis

Divides USD sales or sales less EBITDA for AUO plus LGD by their reported area

The growth rate of capacity growth still drives the crystal cycle... next bust expected in Q2'13

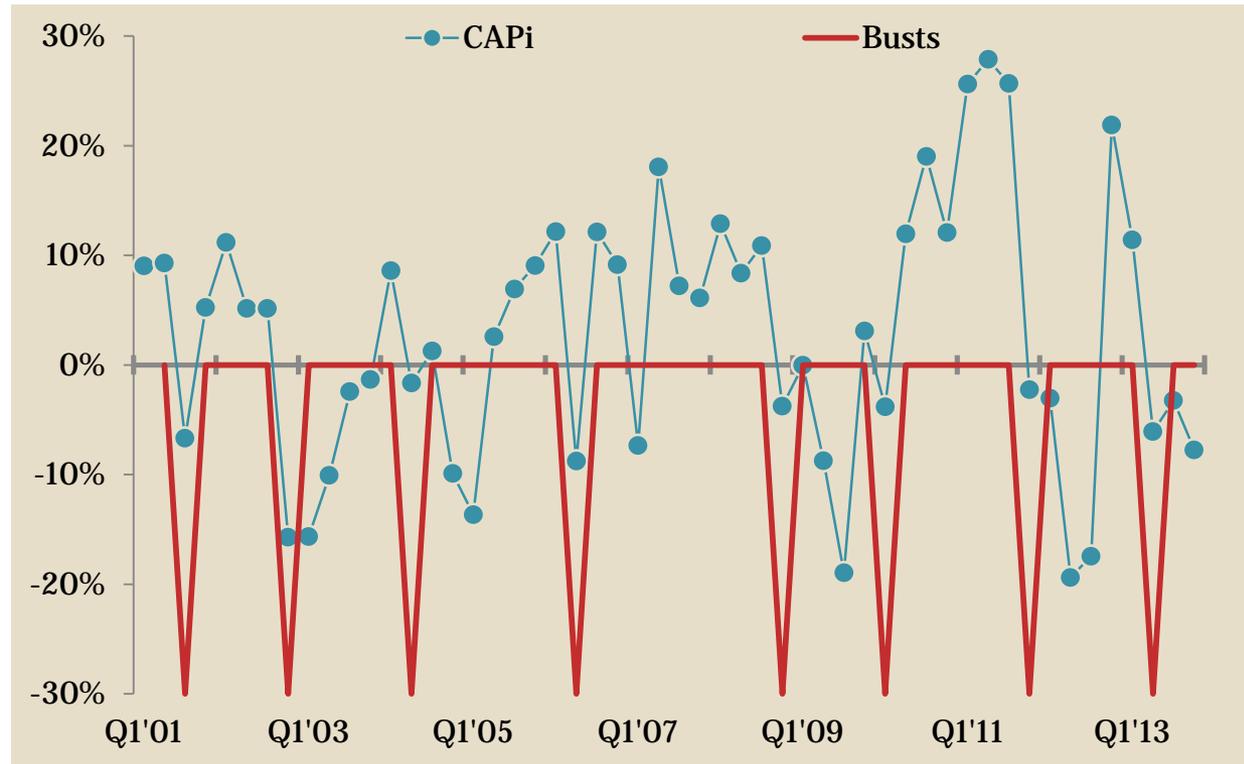
One of the few constants over recent years has been the behavior of display makers.

Capacity may be growing slower but surges in capacity lead to price cycle busts as too much supply chases too few dollars available immediately.

As explained in the Handbook of Visual Display Technology, a capacity-acceleration price predictor has anticipated every down-cycle since 2002.

It looks like AMLCD prices will continue falling and plunge below the trend line when producers make big investments and ramp-up new fabrication facilities.

Capacity-acceleration Price Indicator (CAPI)



Past and future predictions of crystal cycle busts on zero crossings

Source: Handbook of Visual Display Technology, BizWitz analysis

Premium display performance continues to drive material cost upwards

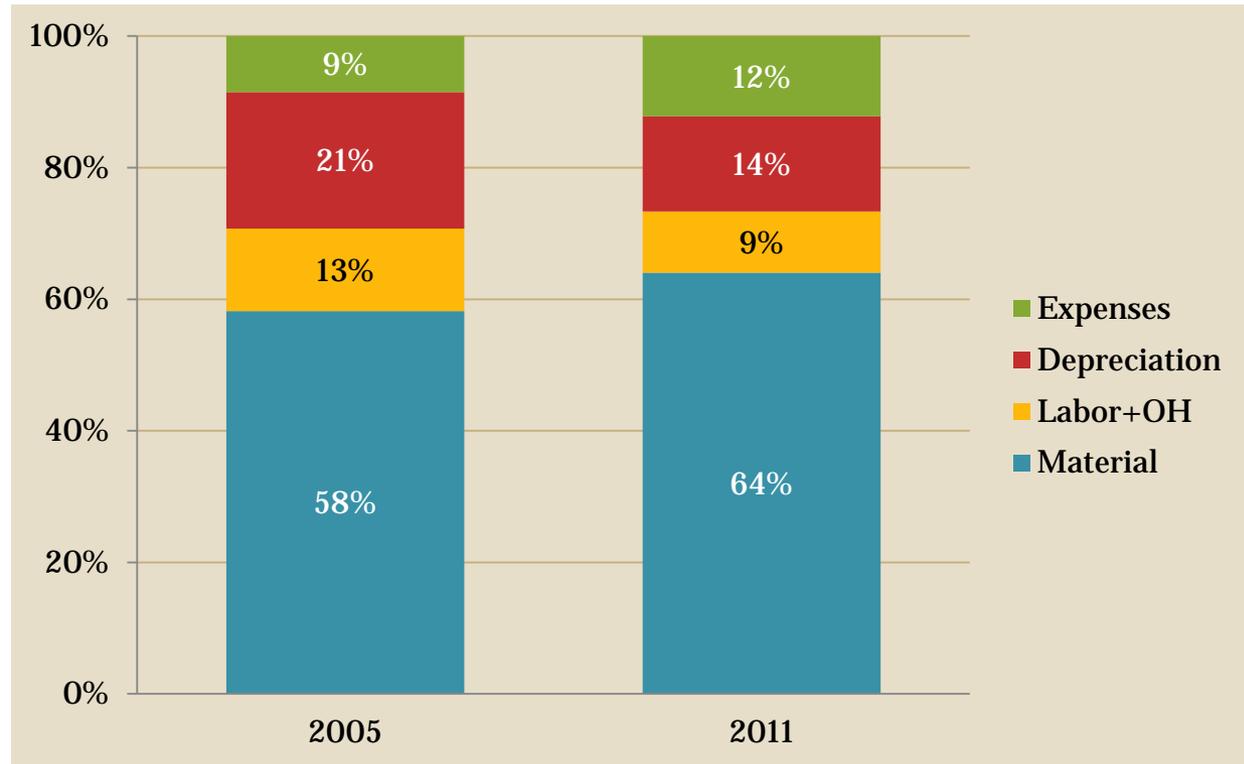
Declining prices per unit of capacity with occasional price cuts below the cost of product cause leaders to seek market segments that offer premium prices (for the right features). In many cases, better displays mean higher costs.

High-performance backlights, fast video and accurate color all require better materials.

As a result, variable costs, for materials mostly, have increased as a portion of COP.

Organizational expenses have become more important also as technology and complexity progress.

Sources of Cost for LG Display in 2005 and 2011



Contributions to the cost of product (Sales – EBIT)

Source: SEC-Edgar disclosures by LG Display, BizWitz analysis

Technology and capacity investments provide no scale benefits

Here is an updated view of the relationship between CapEx and COP or cash-COS.

Costs remain in a linear trend relative to investment.

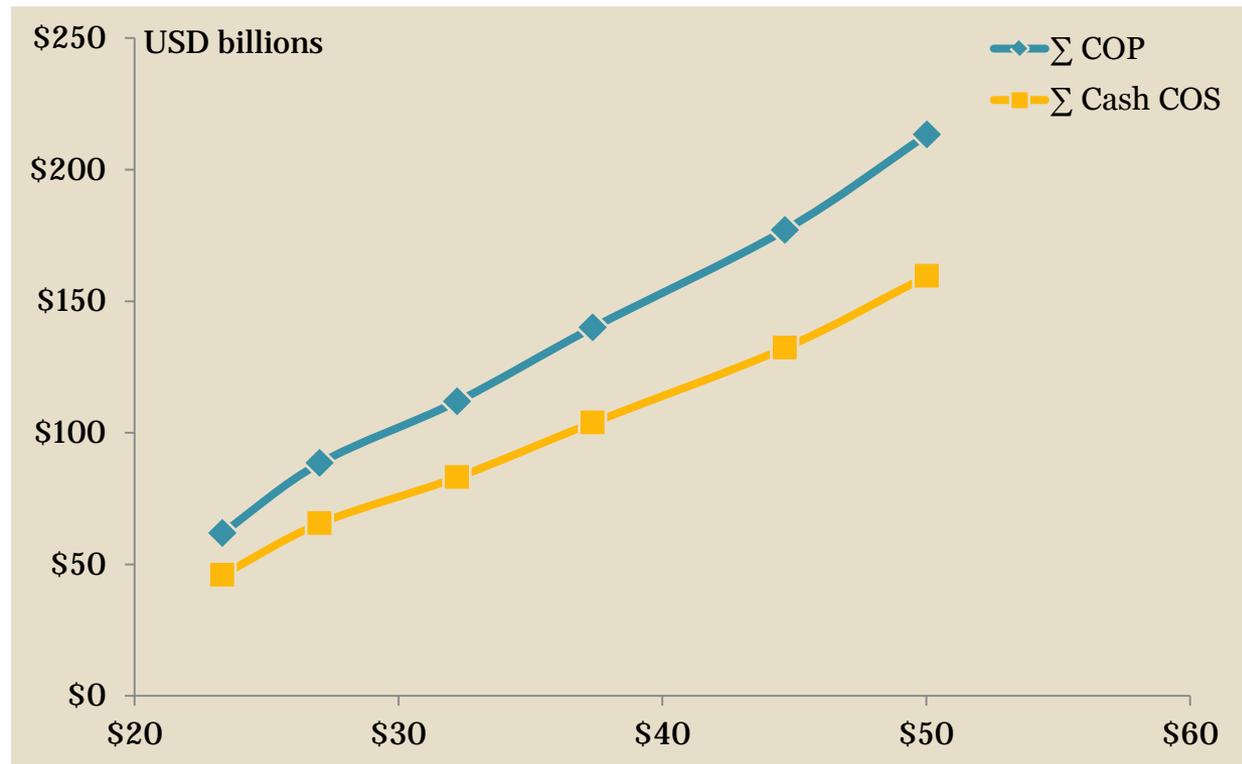
Each dollar spent on capacity multiplies cash-COS by more than \$4 and COP by more than \$5.

More capacity means more material and that drives cost upwards along these lines.

If panel makers enjoyed scale economies, we would see curves, not lines!

This helps explain why the price line is intersecting the cost line, as we saw earlier.

Linear Relation of Cost to CapEx, 2006–2011



Cumulative cash-cost of Sales versus cumulative CapEx beginning in 2001

Source: SEC-Edgar filings by AUO and LGD, BizWitz analysis

It no surprise that display makers have trouble generating (positive) free cash flow

You can win in Texas hold'em if chase others from the game and start winning hands.

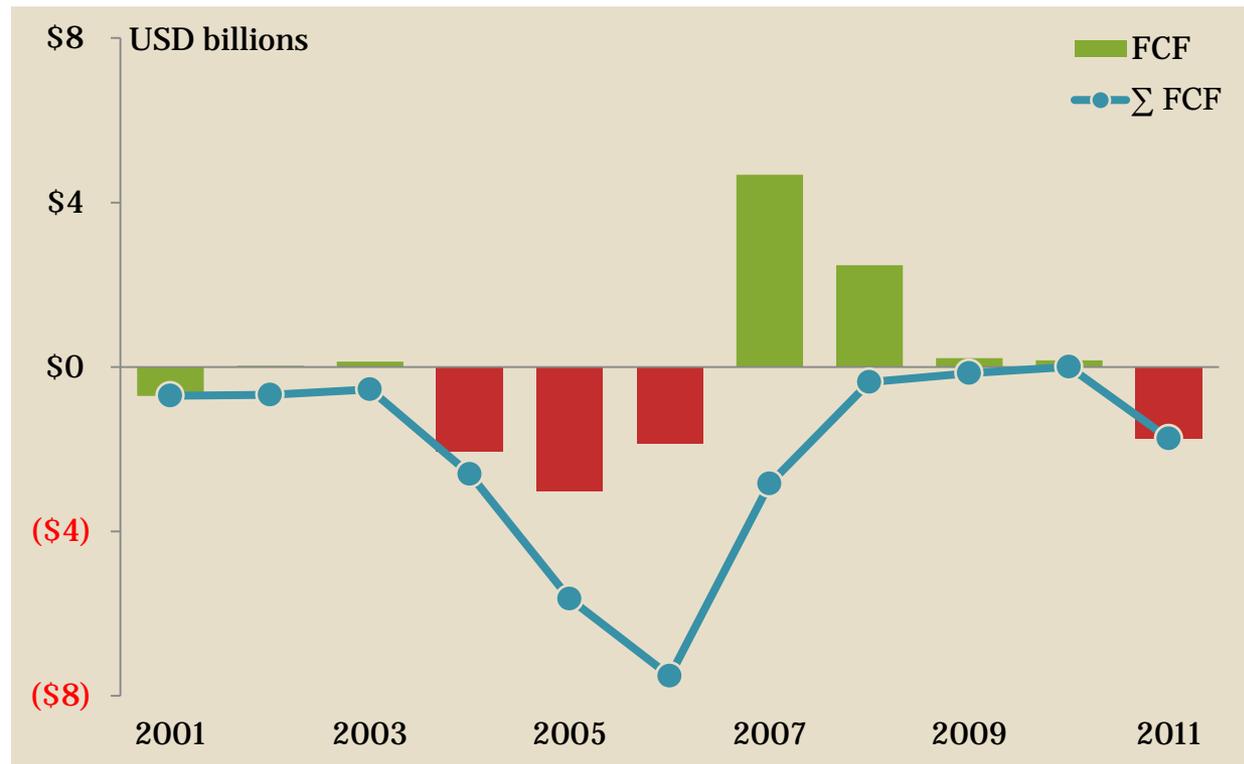
Panel makers have found it difficult to chase others away. New players keep coming to the table with more chips.

As a result, even leaders like AUO and LGD have amassed negative free cash flow since 2001. They are in the hole about \$1.7 billion deep.

Stockholders and lenders have found this disappointing. That is why financing expansion has become more difficult.

The FPD industry needs a new story line...

Free Cash Flow & Accumulation 2001–2011



Sums AU Optronics and LG Display results in USD terms

Source: US SEC-Edgar, BizWitz analysis

AMOLED may mean less variable cost. Will it mean less variable profit?

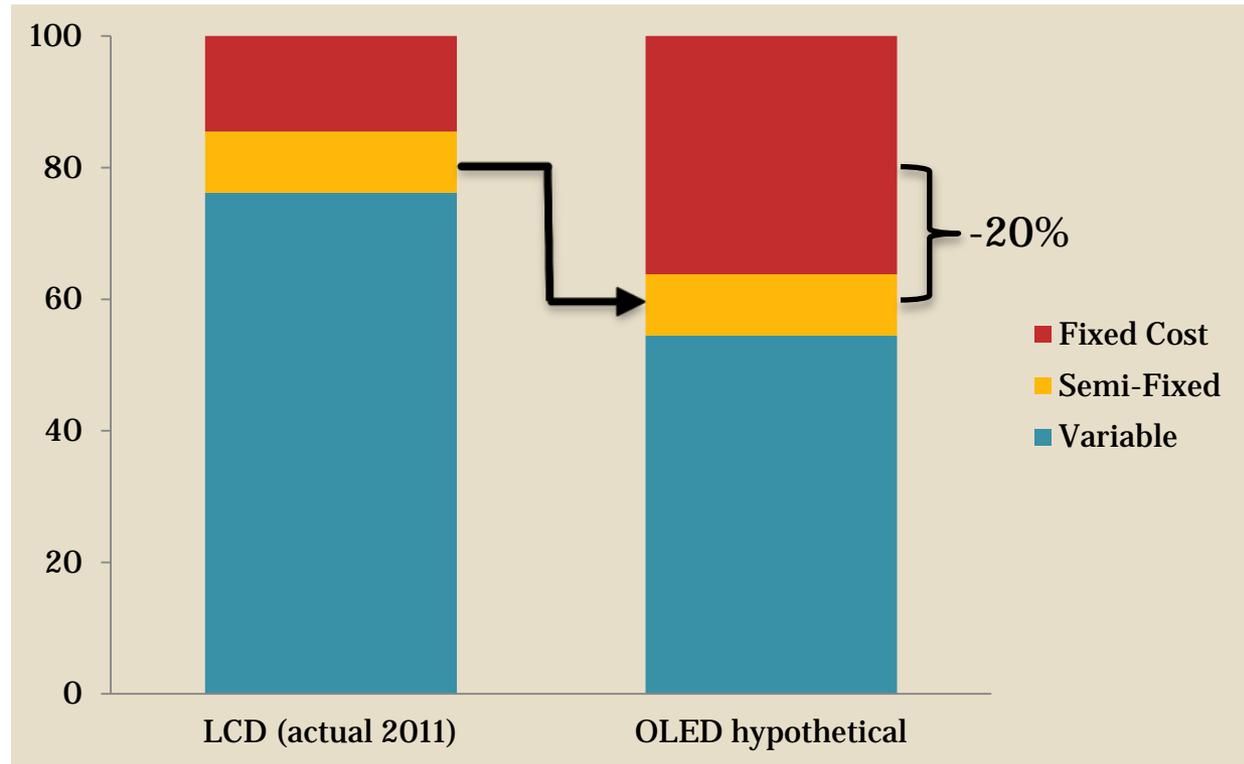
If Samsung duplicates its DRAM strategy (leverages its technical and financial strengths to lead a fixed-cost intensive industry), then it and one or two smaller firms may enjoy AMOLED profits.

A market share in the range of 30% to 70% could keep one or two makers ahead of the pack.

If everyone lands in the land of OLED, however, conditions could deteriorate.

Past behavior suggests makers will cut prices to variable cost.

If OLED means 2.5X fixed-cost share compared to LCD, then price cuts could be 20% deeper in the future.



Cost of product at 100 nominal units and potential depth of price cuts wherein semi-variable costs include R&D plus G&A expenses

Source: LGD disclosures and BizWitz conjecture



- There be dragons for good or ill.
- Life in the new land depends on how many ships land there.
- Most ships are floundering in choppy seas.
- Sailing faster or harder is not helping.
- We may see one of two scenarios play out in the new game of AMOLED.
 - A dominant supplier stabilizes a new industry that becomes profitable for a few players.
 - New players keep bringing new stakes to the table and spoiling the game.

FPD is a difficult business...

BizWitz analysts are here to help



Growth

- Market entry
- Business structure
- Phase gates, R&D

Performance

- Price position
- Cost reduction
- Portfolio balance

CapEx

- Factory plans
- Tool selections
- Plant conversions

Sourcing

- Make/buy
- Value chains
- Supplier selection

Technologies

- Market sensing
- Market & IP value
- Consortia synergy

Alliances

- M&A candidates
- Partnerships, JVs
- Integration plans

Plans

- Strategic audits
- Investor insights
- Business valuation

Materials

- Pricing policies
- Market strategies
- Licenses, royalties