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What happens to the Japanese display and CE industry  
and indeed what happens to display innovation if no-one  
will pay?

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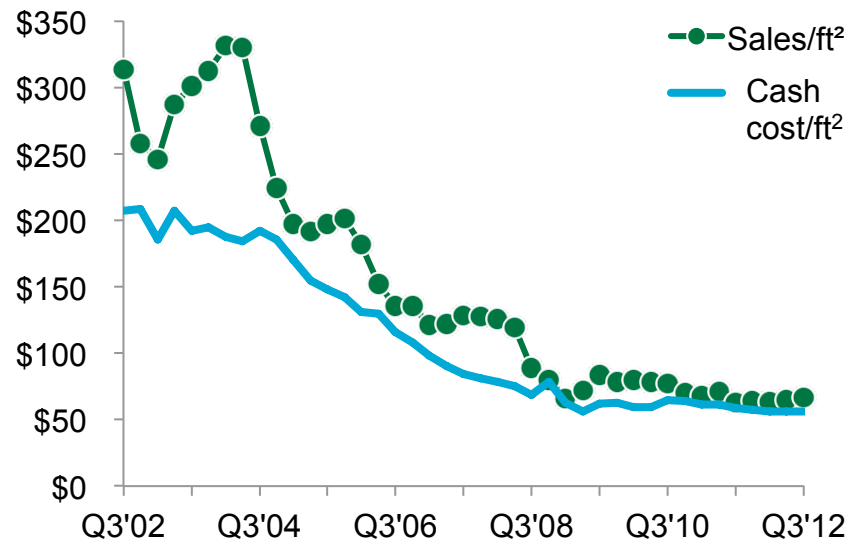
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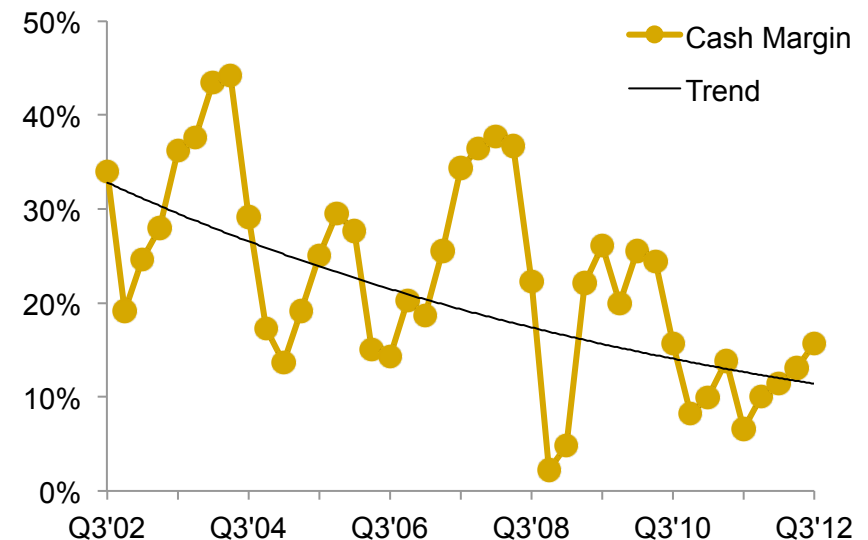
## The Japanese CE industry has been sliding into decline...

Sharp	Panasonic	Sony
<ul style="list-style-type: none"><li>▪ Recent announcement about deepening losses to \$5.6bn for the full year</li><li>▪ Doubts about whether can remain an ongoing concern without a rescue by Japan</li><li>▪ Fitch, Moody and other credit downgrades continue</li><li>▪ Seeking OEM deals with Apple, Google, HP and discussion on corporate notes deal with Intel.</li><li>▪ Discussions with Foxconn may continue beyond the deal deadline</li><li>▪ \$2.5bn of convertible debt maturing in 2013</li><li>▪ Just announced deal with Qualcomm</li></ul>	<ul style="list-style-type: none"><li>▪ Recent report expects a full year loss of \$9.6bn (would be its second greatest loss) despite restructuring and cutting over 39,000 employees.</li><li>▪ Losses based in a large part on write-down of goodwill on solar, handset and battery businesses</li><li>▪ Panasonic has a TV business with reasonable market share but display assets in PDP (partly impaired by current CEO) and small scale in LCD</li><li>▪ Moody's cut its credit rating to Baa3 on Nov 20th</li></ul>	<ul style="list-style-type: none"><li>▪ Aiming for full year \$249m net income but with more quarterly losses in quarter to September</li><li>▪ Losses in TV slightly improved to 10.2bn Yen in quarter to September 2012</li><li>▪ Has cut 2012 TV sales target from 17.5m to 15.5m</li><li>▪ CEO has recently made acquisitions in medical imaging (shares in Olympus) and cloud computing</li><li>▪ Claim that TV remains core to Sony DNA despite losses</li><li>▪ Moody's cut its long term credit rating to Baa3 on Nov 9th</li></ul>

....mirroring a decade of margin compression in the display industry:



- Area-based prices have fallen at a 19% compound annual rate for all AMLCD over the last 2 decades.
- Combined AUO+LCD sales fall similarly because they are about one-half of the industry.
- Note that their Cash Cost (Sales-EBITDA) has been falling 2 points slower than their sales for a declining EBITDA margin



- Cash margin/m² for AUO+LGD in USD terms is falling on trend from 34% in Q3'02 to 16% in Q3'12.
- This is a proxy for free cash flow: decreasing returns to scale is evident.
- Based on comparable Q3'12 results, LGD and SDC outperform AUO and CMI.

## Sharp has put itself into a difficult situation based on a number of poor decisions lasting nearly a decade:

Sharp

Panasonic

Sony

Who pays?

Too little capacity then too much

Flip flopping B2B and B2C strategies

Poorly played bet on IGZO in Kameyama

Aggressive bet on solar before all competing bets were placed

Sakai Gen 10 is a misfit fab (reminds us of Hitachi's V2)

Risky strategy to miss the "gap in the middle"

- We can trace back the reasons for Sharp's current financial situation to the early 1990s
  - Late to invest into large panel capacity and then when they did invest into Kameyama (Gen 8) and Sakai (Gen 10) it was too much
- The channel has developed concerns, we hear, over Sharp's strategy changes between branded and B2B sales; they lost trust
- Recent problems stem from to a risky new strategy (we understand the motive but it isolates Sharp further by stopping sales to mid-tier TV and IT markets) and a risky new technology (IGZO) for premium products

In addition to Sharp- specific problems, Japanese stimulus policies in 2010-2011 pulled-in domestic demand and left 2012 demand too low:

Sharp

Panasonic

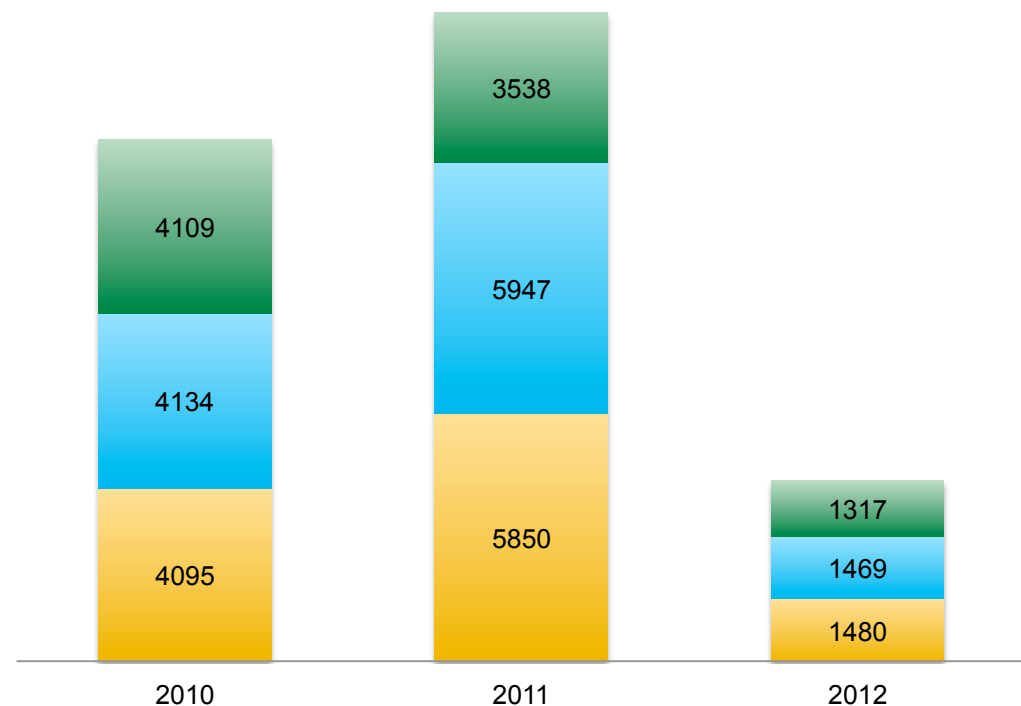
Sony

Who pays?

- Japanese stimulus packages from 2009 designed to increase domestic consumption
- One of the provisions was a 5% subsidy on “energy efficient” LCD TVs
  - The effect of this was to pull demand in from 2012-2013
  - YTD through Q3’12, domestic FPD TV demand declined 71% from the same period in 2011
- Of course this impacted Panasonic, and Sony also, but Sharp is more reliant on the domestic market

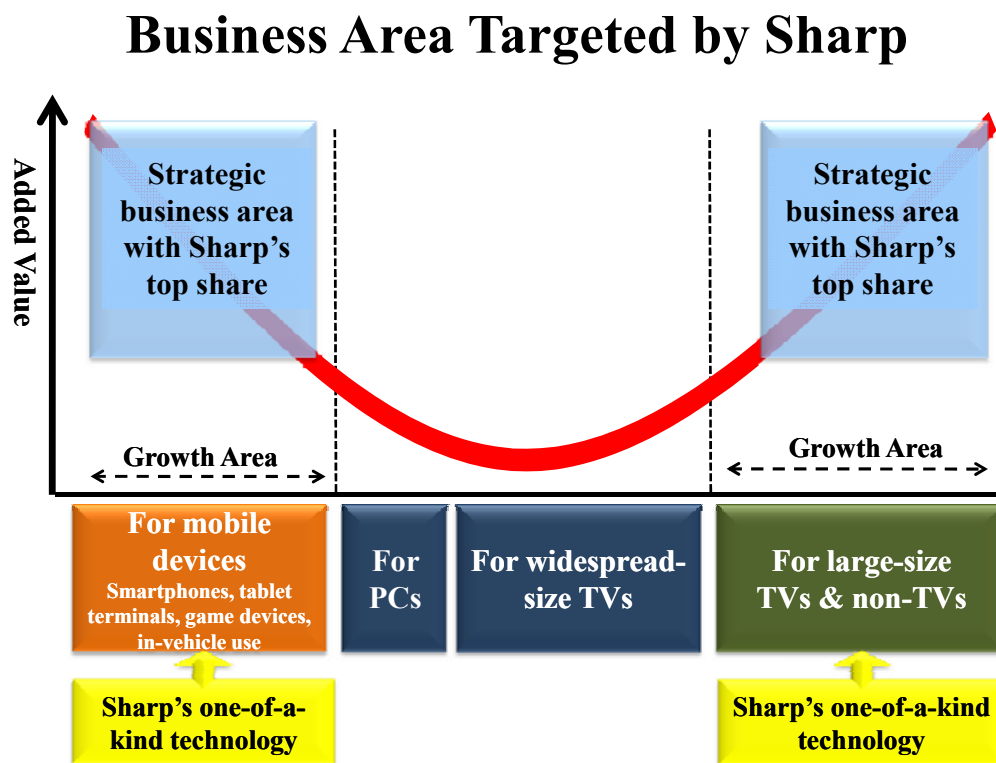
### Japanese domestic shipment of FPD TV, units Year to August in each case

■ Sizes less than 29 inch ■ Sizes 30-36 inches ■ Sizes 37+ inches



Sharp chose to pursue the risky strategy of giving up the middle ground. New strategy relies on areas where Sharp has know-how, but perhaps not the requisite IP:

Sharp
Panasonic
Sony
Who pays?



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- Sharp has predicated its change in strategy on giving up the middle ground in the display industry the mid-tier TVs and IT products
- We agree that the mid-sized (30" to 49") TV business is commoditised and unattractive financially, but it remains important and represents 75% of total TV screen-area demand
- Sharp aimed to focus on its own CGS (its own brand of LTPS) technology and IGZO technology for mobile devices and IGZO also for 4k2k and higher resolution large panel
- Sharp may well now have learned some valuable lessons about how to make IGZO but quite a bit of the core IP is owned by SEL or JIST

# Sharp's display assets have various liquidities. Some assets be could be sold and moved... others not:

## Sakai (SDP)

- Sole Gen 10 in the display industry which is bad news because equipment suppliers are supporting a 1-of-a-kind facility (The only other Gen 10 is one being discussed by CEC-Panda) .
- Moreover the economics of Gen 10 are only beneficial for very large TV, otherwise the larger the substrate the higher the material cost is per m<sup>2</sup> due to defect density questions
- Sakai is an island "Campus" co-located with colour filter and glass lines (Corning)
- Recently DNP and Toppan operations folded into Sakai (Sharp Display Products)
- Recent problems loading Sakai

## Kameyama (Large panel converting to tablets and high performance IT)

- Gen 8 factory in Kameyama
- 2160x2460mm at 80k sheets total.
- Transitioning to IGZO but the transition has not been smooth
- Challenge: converting this much capacity to tablets or other small panels demands large shares of markets competitors seek also
- Kameyama site has LTPS capacity also, up to 20k sheets of Gen 6 capacity

## Taki and Tenri plants (Small panel)

- 95k of LTPS (CGS) in CGS B fab of 730x920mm
- Taki plant 2 phases C and D: 108k per month of 680x880mm
- Tenri CGS A: 15k sheets 620x750mm
- The small panel business has always been one of the stronger parts of Sharp's business with ability to drive specifications and demand premium pricing

# What does Sharp have?:

Sharp

Panasonic

Sony

Who pays?

- A reputation as a technology leader in the display industry backed by innovations such as their own metal induced crystallisation process (CGS), for LTPS and collaboration with SEL on IGZO
  - Recent work on CAAC-IGZO is particularly interesting but we hear there are no plans to put this in mass production
  - Sharp is the first to ship IGZO TFT panels but others are developing such ability rapidly, also
- A reputation for high technology especially in the small panel business, with a history of setting specifications and achieving high prices
- A mid-tier brand name, unfortunately, as a branded TV supplier
- A “black box” approach to technology development, where Sharp often goes it alone
- Unclear plans for OLED though plenty of work in R&D
- A general marketing positioning around high resolution (4k2k and 8k4k TVs) LCDs that it believes offer a “3D like” real experience without having to be 3D
- A historic relationship with Apple to the degree that Sharp is still considered one of the true technology players to the display industry
- In general the Japanese (unlike the Koreans) have a reputation for building fairly “rigid” factory concepts with less forward-looking upgradability
- Around 60,000 employees as of September 30<sup>th</sup> 2012



Factory loading and customer acquisition has been an ongoing problem. Large numbers of OEM deals have been rumoured as a result

Sharp

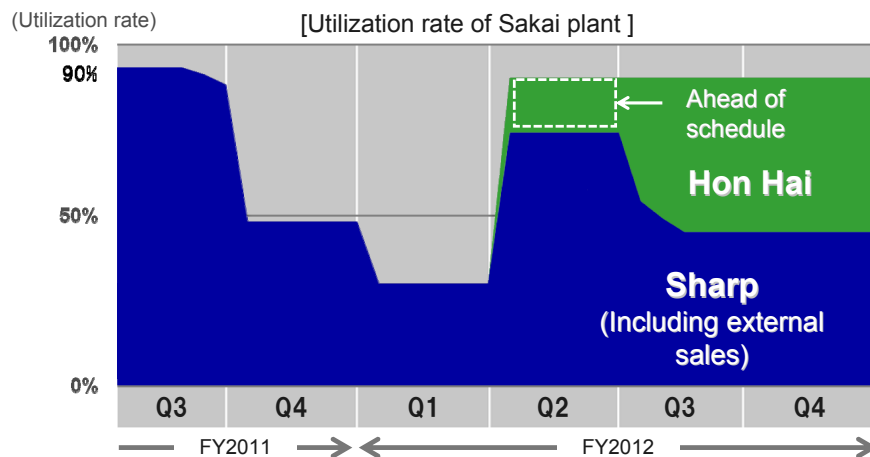
Panasonic

Sony

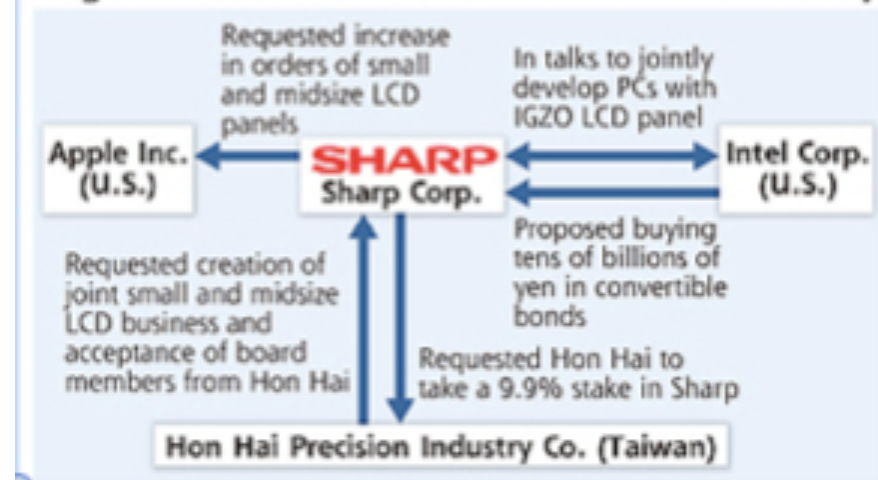
Who pays?

## (2) Stable operation of Sakai plant

Hon Hai will procure LCD panels in FY2012 Q2 ahead of schedule



## Negotiations with overseas firms to overhaul Sharp



- Sharp was messaging that deal with Hon Hai would help with Sakai, but then a further corporate level deal went cold and Sharp has sold panels to Samsung
- Ongoing need for brands that can clear large panel TVs

- Additional deals mentioned more recently with Apple, Dell, HP, Google and others (Source Bloomberg)
- Recent deal achieved with Qualcomm

# With IGZO conversion for Kameyama, rededication economics depend on getting the fab back to capacity fast

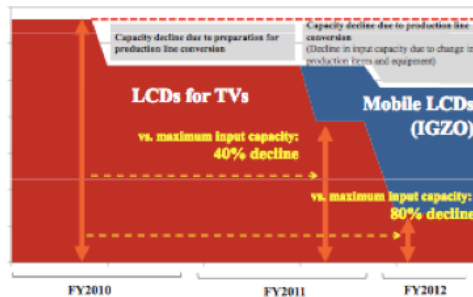
Sharp

Panasonic

Sony

Who pays?

## Decline in Production of LCDs for TVs (Smaller Than 40") at Kameyama No.2



	Before	After
Revenue	\$1438m	\$1786m
EBITDA	\$200m	\$900m
Conversion time	6 months	
Conversion capex	\$20m, say	

- Let's assume we are converting a 80k sheet Gen 8 from 42" TV to 42" IGZO 4k2k TV
- Revenue before
  - $80k * 12 * \$220 * 8\text{-up} * 85\% = \$1436m$
- Revenue after (assuming you can get to 75% yield quickly)
  - $80k * (1-38\%) * 12 * \$500 * 8\text{ up} * 75\% = \$1786m$
- EBITDA before based on 14% EBITDA today: \$200m
- EBITDA after:
  - Assume fixed costs are the same absolute number
  - Assume material costs are higher (due to impact of yield) per panel on an absolute basis and due to higher absolute costs for drivers, optical films, LEDs etc
- Lost EBITDA during conversion: \$100m say in 6 months but also during this time you need to cover the additional fixed cost of \$115m
- Capex: \$20m for rebalancing and new equipment, say, with further debottlenecking capex later
- The incremental EBITDA is \$700m in the first full year (declining thereafter) against a loss of EBITDA/fixed coverage of \$215m per 6 months and the conversion capex of \$20m
- The speed that you can bring the line back up to decent yields is the most critical driver in conversion economics. Next to this, overall pricing environment for IGZO panels: over time the premium will fall

# Sharp pretty much needs to find a “Big Daddy” funding partner with access to supply chains in China

Sharp

Panasonic

Sony

Who pays?

- Sharp has seen its capacity share dwindle despite the investments into Kameyama and Sakai
- Really trying to answer the question here of who would benefit most with the Sharp assets (where the value is the engineers and knowhow): its translating these into new fabs in China for someone who can arrange the land, funding and tax breaks that is the important partner. This is a big daddy figure
- Future investment into displays is pretty much in the hands of the Chinese both as the place of future capacity expansion but also in terms of new materials supply chains that might be able to provide some economic relief to the 70% of LCD costs that are the materials
- CSOT has recently been announced in discussions with CPT as an acquisition (a massive HR strategy in our view)
- CEC-Panda might be an obvious candidate given that Sharp has an established technical collaboration with them in Nanjing, and former equipment sales
- Electronics majors like BOE and Huawei might seem to be candidates also

## ***Potential Big Daddy deals***

Hon Hai

CEC (Panda & TPV)



















CSOT-TCL

Huawei

BOE

Many different deals have been suggested for Sharp, but the core valuable business is the small/medium displays business:

Sharp  
Panasonic  
Sony  
Who pays?

	Honhai	Intel	HP	BOE	CEC Panda	Apple	Comments
Sakai (Gen 10 TV)							One-of-a-kind white elephant
Kameyama (Tablet, IT)							May be moveable and valuable
Taki and Tenri (Kameyama CGS)							May be moveable and valuable

- The small medium business overall has always been the more attractive piece of Sharp
- The Kameyama fab, once transitioned to tablets and IT products based on IGZO might be valuable and relocatable or part of a deal with the Chinese or others
- It is the Sakai Gen 10 fab that is the most difficult story and really only makes sense as a supplier to large panel TV markets for strong brands. CEC-Panda is the only other firm that has been contemplating a Gen 10 and for them, there might be valuable lessons in how to run one

# Potential outcomes for Sharp:

Sharp

Panasonic

Sony

Who pays?

## Struggles through

- We hope that Sharp finds enough support for local refinancing of debts that it can struggle through but it has admitted that there are doubts that it can continue as an ongoing concern
- The notion of whether Sharp needs to surrender any management control to potential investors seems central to the myriad of deals being discussed

## Liquidation in parts

- Quite possibly Sharp is sold in pieces
- The Sakai assets are probably the most difficult. One of a kind fab with only a role for large TV/signage. There are not many companies for which this is a fit
- The small medium business has better chances for people to take and move asset and engineers

## Folded into JDI

- This option might be politically feasible, but we believe that JDI is busy integrating the remains of three Japanese display companies having only one strong source of demand (Apple)
- We wonder how Apple also would respond to a reduction in their supply base

## Bail out by the government

- The notion of a government bailout has already been raised, given the 60,000 staff that work for Sharp (and the myriad of sub suppliers)
- However, the LDP is looking to Sharp to provide a strong restructuring plan before this could take place

## Purchased by the Chinese

- As we have already inferred, a deal by one of the Chinese majors might make sense at the right price as a way to buy engineers and some decent assets at a discount

## Sharp summary:

Sharp

Panasonic

Sony

Who pays?

- Sharp's current situation is the result of business decisions going back a decade
- The big challenge with Sharp is that the technology is differentiated, but not fully owned by them
  - Assets are a mixed bag; some are transferrable and fairly valuable but Sakai is a big white elephant
  - Some of the most interesting new technology in IGZO, the core IP is owned by SEL and Sharp has been working pretty independently from sputter suppliers like ULVAC since they don't want the learnings to go elsewhere. This of course means that suppliers cannot help either
- From what we understand the Japanese government are unlikely to want to see this go over to the Taiwanese in a deal with Hon Hai, but they are not going to be too fond of a government bail-out either
  - Rumours in particular about folding Sharp into JDI but we wonder whether Apple would be happy with this as a solution
- We do not see there to be a “magic solution” for them. Technical execution on IGZO to get Kameyama 2 under control is a key action as is cutting long term supply deals with key OEM's to make the most out of the upside from new high-res product (tablet, handset and 4k2k and higher TV)
- We wonder how long it will be before they have to fall into the arms of a large Chinese technology company
- The only saving grace may be a myriad of smaller deals (much like the Qualcomm deal) from major International firms that give Sharp a way to muddle through

# Panasonic has a PDP business and 1 LCD fab since 2012

Sharp

Panasonic

Sony

Who pays?

## PDP business

- Recent closure of Amagasaki 1 PDP fab (1664x1961mm) and Amagasaki 3 (2200x3920mm) by the current CEO
- Still running the remaining 1 fab: Amagasaki 2 (1961 x 2218 mm)
- These assets now are written down and being used on a cash-positive basis only

## LCD business

- Rededicating the IPSA Himeji Gen 8 fab towards medium and small panels and also looking at a 4k2k offering
- Reducing input starts during the conversion from 48k substrates/month to 35k substrates per month
- May join forces with AUO for AMOLED production in 2015. For now the collaboration is between Sony and Panasonic

- Panasonic also rumoured to be considering a new AMOLED facility in an collaboration with Sony, Sumitomo Chemical and CDT/Summation (AUO was initially considered as part of this group also)
  - We wonder how these companies plan to bring IJP back to the centre stage when it is so far behind evaporation and laser based techniques
  - We wonder also whether Panasonic has the balance sheet for such an investment
- The new CEO is known for blunt talk and fast decisions but his options (and cash) are decreasing each quarter

- Sony is not a player in the FPD market, despite being an important player in CRT years ago
- They exited a capacity-sharing collaboration with Samsung (S-LCD) after realizing that making TV panels is no longer a value-creating activity
- Sony retained some flexible display technology after divesting the rest into Japan Display and they are looking at a new AMOLED fab based on ink-jet printed polymers with Panasonic
- The larger question is how displays fit into the new Sony — the firm is in the midst of a major transformation — and whether traditional consumer electronics will remain important
  - The Trinitron CRT provided Sony with a distinct product that could be enhanced with excellent analog know-how
  - The digital TV revolution makes such differentiation impossible and Sony was forced to cut its obsolete analog overhead and outsource most of its digital TV production
  - We wonder how much “Wow!” Sony has left in its technical bag of tricks in this modern world of commodity hardware and differentiated software
- Looking at Philips as the legacy CE thought leader, we assume all TV-as-we-know-it will be outsourced, even branded in China
- Sony either competes with Apple and Samsung, or it becomes irrelevant



The macro-level question on the table is what happens to the display industry if no one wants to pay for innovation:

- Sharp
- Panasonic
- Sony
- Who pays?

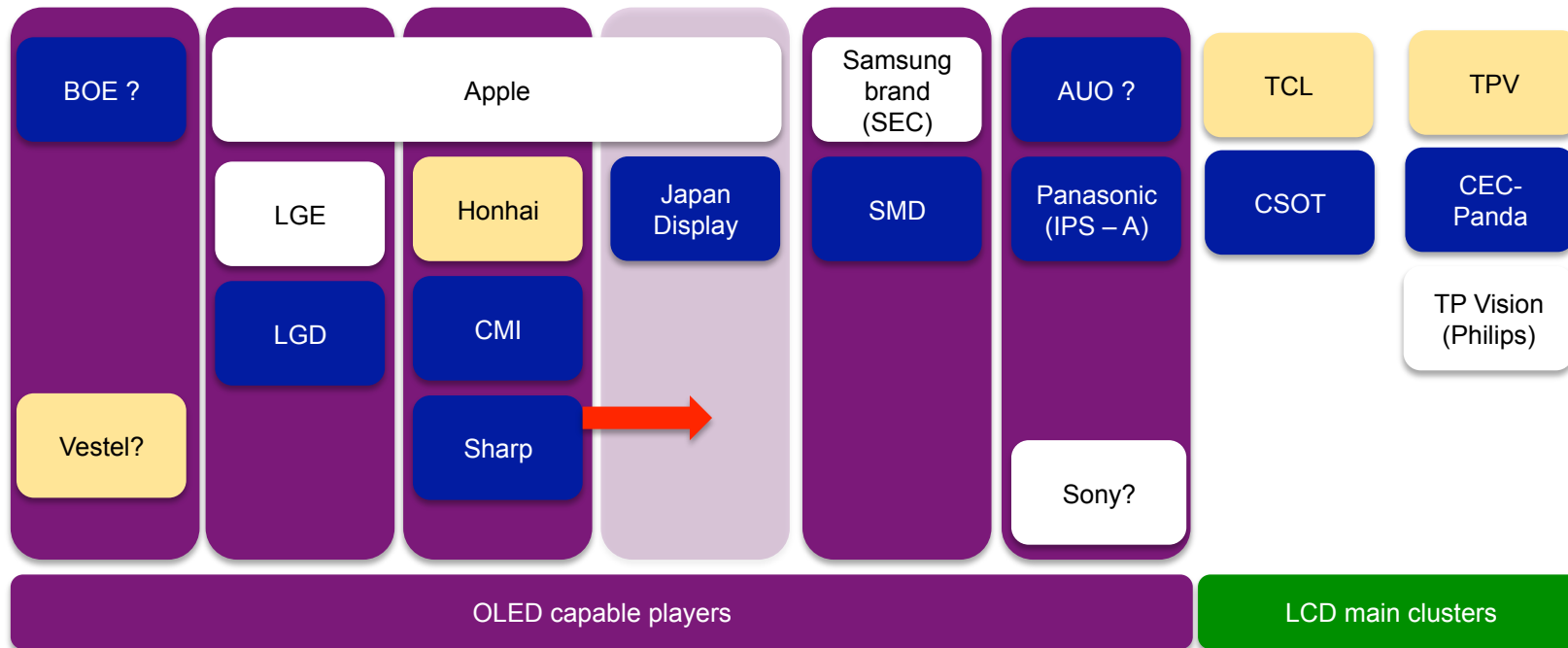
	Base case	Tech race	Race to the bottom	a-Si wins since "Good enough"	Display industry saves itself
Metal oxide	Slow roll out for hi-def TV & mobile devices. Retrofit of a-Si	Metal oxide becomes important but coexists with architecture led LTPS	Metal oxide destroys LTPS value proposition but gains no premium over a-Si	Metal oxide fails to be important in comparison to a-Si	Metal oxide and a-Si coexist, with MO positioned above a-Si
AMOLED	2-3 players develop positions mostly in mobile devices	AMOLED flourishes and hits high-end price points in EU, Japan and US	AMOLED survives in mobile apps as MO TFT becomes cost competitive with a-Si	AMOLED flounders and remains a niche technology	AMOLED has a role for mobile devices and some TV and enables flexible
Market development	Mobile devices still more important. TV replacement faster, but not by much	Market is excited by new offerings. Some TV growth delivered in return	Markets grow but at low price points. Prices fall at 20%+	Markets grow but prices continue down	Price declines slow down as newer technology gains ground
Impact on players	Smaller players in Taiwan and Japan close or convert. New BRIC players	AMOLED or LTPS capable players break from the pack	Faster exits from the industry. Customers gain more power in funding future fabs	Niche technologies fail. Legacy transfer continues faster and more new players	Players begin to specialise in technologies or regional markets
Impact on profits	Profits stabilise but at lower levels. Participation in novel tech or materials key	Increasing profits for technology leaders and for AMOLED "all-in" players	Profits remain poor. Apple, Samsung and HP pay for the fabs they want	Profits remain poor, which leads to more vertical models. Merchants are poorer	Profit improves as display value offsets material cost

In 2011 we looked at a scenario view of the display industry and one option was "race to the bottom" in which, Apple, Samsung, HP (Microsoft and perhaps a few others) become effectively the only players able to fund future display investments

- So far in history, true innovations have been driven by brand innovations such as portable electronics (Sharp), jumbo TV (LG/Samsung) or apps stores (Apple).
- Display makers mostly pile into proven markets. Chinese panel makers seem to have unlimited financial resources to continue such expansion, but do they have the competencies, the money and the interest in supporting display innovation?

Will display innovation and value creation remain the domain of Apple, Samsung and a few ODM while display companies remain “captive” cost centres?

Sharp  
Panasonic  
Sony  
Who pays?



We published this outlook of company affiliations earlier in the year. Where will OEMs fit into this picture and who will align with whom? AUO seem isolated in the big picture. Where will Microsoft, Intel, HP, Dell, Lenovo and others fit and how will Apple or Samsung seek to control the game?

# Service offerings

<b>Growth strategy</b> <ul style="list-style-type: none"><li>• Market entry strategy</li><li>• Business unit strategy</li><li>• Growth strategies for new technologies</li></ul>	<b>Performance improvement</b> <ul style="list-style-type: none"><li>• Product portfolio management</li><li>• Pricing strategy</li><li>• Cost reduction</li></ul>	<b>Equipment and Capex</b> <ul style="list-style-type: none"><li>• LCD/OLED factory capex decisions</li><li>• Strategies for equipment makers</li></ul>	<b>Sourcing strategy (Purchasing)</b> <ul style="list-style-type: none"><li>• Sourcing strategies, especially LCD and medical detectors</li><li>• Make/buy decisions</li></ul>
<b>Technology strategy and technology assessment</b> <ul style="list-style-type: none"><li>• Market and commercial strategies for new technology businesses</li><li>• Market tracking services for corporates monitoring technology</li></ul>	<b>Partnering and alliances</b> <ul style="list-style-type: none"><li>• M&amp;A candidates and assessments</li><li>• Alliance formation support</li><li>• Post merger integration planning</li></ul>	<b>Professional advisory and business planning</b> <ul style="list-style-type: none"><li>• Specialist insights for bankers, equity investors and other consultancies</li><li>• Reviews of business plans and models (Strategic audits)</li></ul>	<b>Strategies for materials providers</b> <ul style="list-style-type: none"><li>• Strategy support for materials providers in the FPD, SSL, and PV markets</li><li>• IP and pricing plans</li></ul>