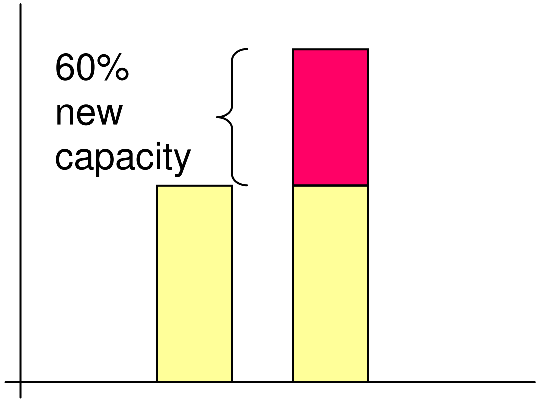
Large panel LCD Industry outlook

December 2004

Hendy Consulting
Impact, Insight, Integrity

Market context: New Gen 5/6/7 fabs risk putting the industry into systemic oversupply…

Industry capacity put in place in 2005



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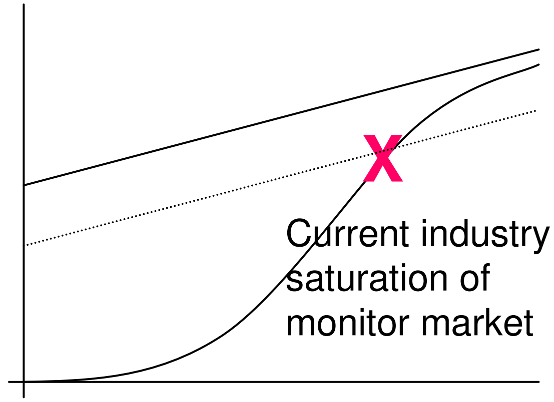
Additional monitor space opportunity



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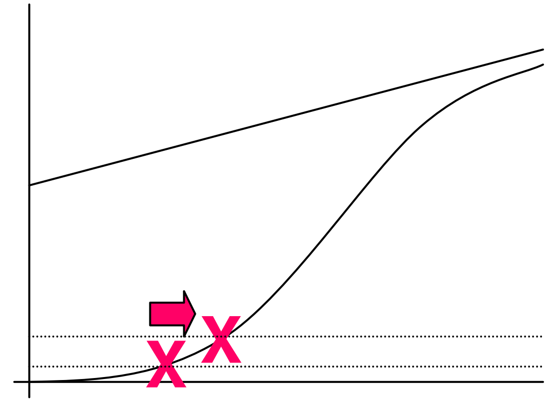
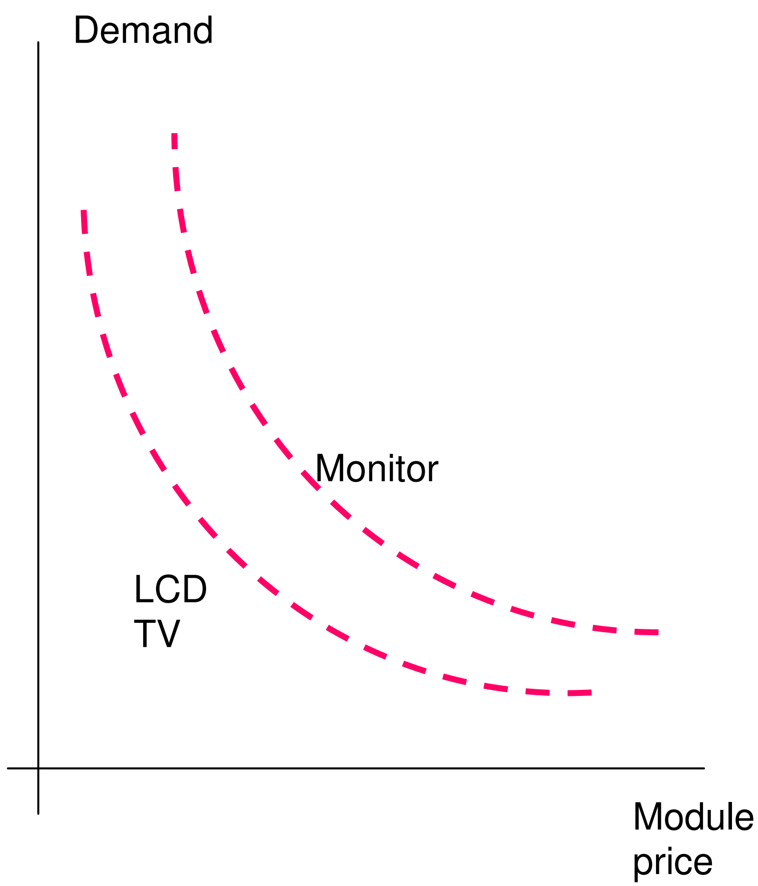
LCD TV demands



- Industry capacity plans for 2005, suggest 60% more total industry capacity
- However, with the current levels of saturation of the LCD monitor market and the steep elasticity of the LCD TV market, the potential incremental demand is much lower

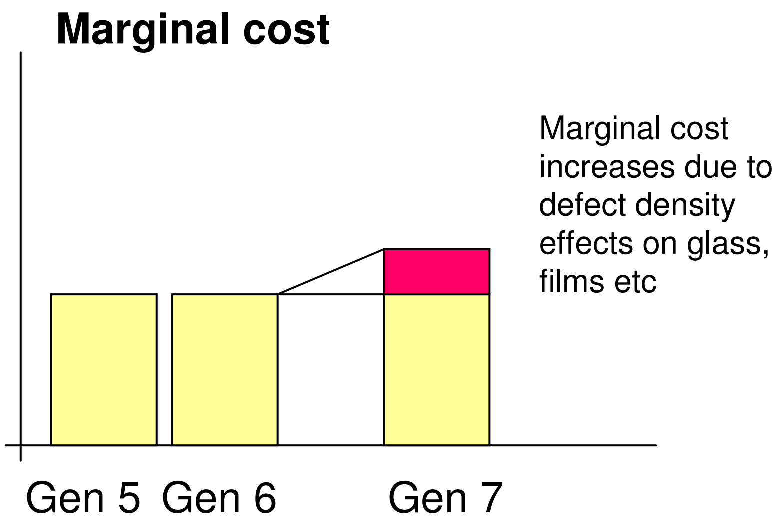
- There is a risk of systemic oversupply, unlike what we have ever previously seen in the LCD industry

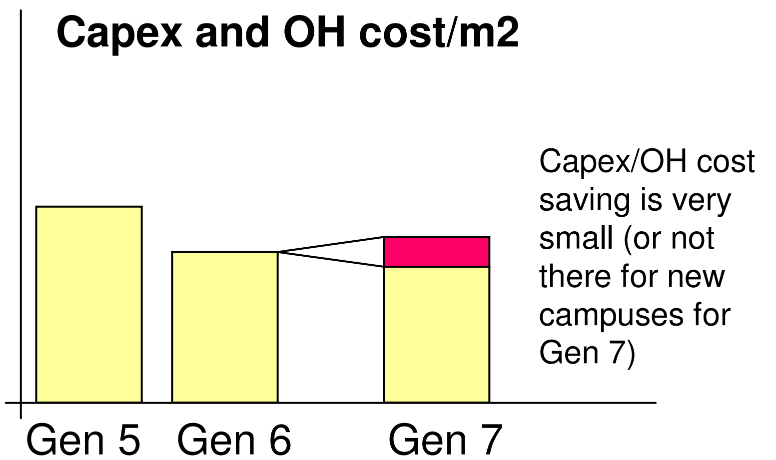
Market context: Since the price points you need to reach to move substantial volumes of LCD TV are much lower than today's LCD cost points



- The demand elasticity function for LCD TV gives lower demand at each price point than in the monitor or TV markets
  - Costs for LCD TV exceed those for monitors and notebooks even when adjusted on a m^2 basis
  - CE channels require much greater mark-ups than the PC channels (typically 3-3.5x the panel price instead of 1.75-2.25 with the PC channels)

Market context:…and it is not clear that Gen 7 fabs actually give you a breakthrough in capex or marginal cost per m²…





- The industry is facing diminishing returns of capital productivity
  - Gen 7 represents only incremental improvements over Gen 6
- Additionally, on a marginal cost basis as the substrate gets substantially larger the cost/m^2 actually increases due to defect density effects
- Also, incremental capex/OH saving vs Gen 6 is very small

Implications for the industry…

- Systemic oversupply is going to be tough on the LCD industry
  - "A falling tide lowers all boats"
  - However, tier one players will potentially do better than others if they can seek to control more capacity and more demand channels without putting additional capital at risk

- Companies need to prepare for the oversupply by:
  - Reinforcing their relationships with their customers
  - Managing mix to being as optimal as possible
  - Continuous pressure on material cost downs especially in the TV space
    - Players need to realize that they are more and more in a materials business (capex/COGS is declining over time)
  - Considering new breakthrough ways to increase shareholder value without investing in additional capacity…

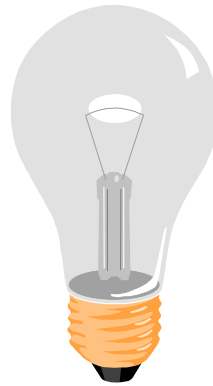
We believe that there are a number of strategy options that will enhance tier one players' value without further damaging the industry supply/demand balance

Forward integration

- Lower product complexity and bring in additional margin

Rearward integration

- Seize the locked up value in display materials



New approaches in equipment

- Potential single-product dedicated in-line solutions

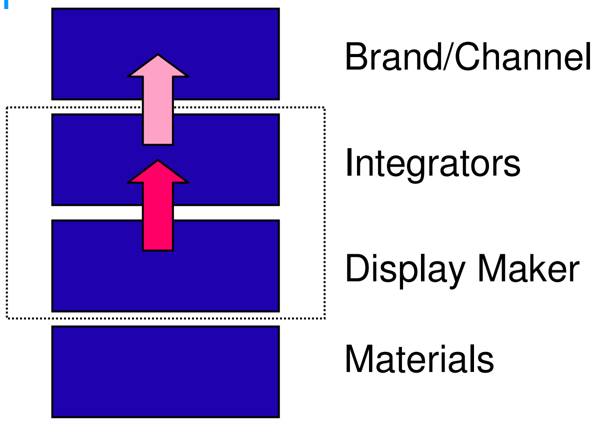
M&A or consortia behaviour

- Share future investments or seize merger synergy

New models

- Commercial opportunities reinforce role of 1st tier players

Idea 1: Forward integration



Rationale for change

- Display makers carry the vast majority of the capital risk for the display chain, so any improvements in top line can help improve profitability and return on capital invested
- Forward integration would remove several “double design” and “double handling steps”
- A display maker spends substantial efforts managing product complexity – and an integrator does so also to differentiate their offerings – there are potential reductions in product complexity available from combining the 2 areas especially since architectures for monitors (and soon TV) are becoming increasingly simple
- Allows display makers to drop ship straight into retail channels, and able to control retail pricing much more directly

Potential positive impact

- Financial benefit in the system from reduced double design and double handling ($500k-1m per product on the design side?)
- Overall reductions in system complexity are known to have wonderful benefits on fab yield and fab mix – potentially very substantial financial benefit
- Option to drop ship straight into retail channels would allow display maker to manage the elasticity of demand and consumer pricing for LCD TV to their own optimal benefit

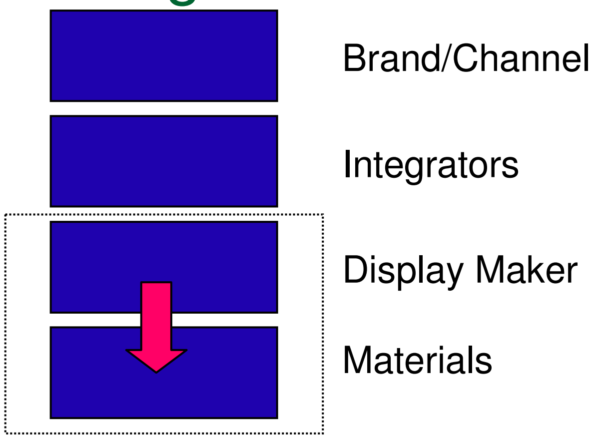
Issues to be overcome

- Need to fund a way to make the plan acceptable to other customers of the company (other integrators): must find a way so that it doesn’t look like you are competing with your own customers

- New skills and capabilities needed for the company in marketing, product management, logistics, product design, logistics, supply-chain management

Reduce product complexity and capture increased margin allowing display maker to drop ship directly to customers

Idea 2: Rearward integration to a greater extent



Rationale for change

- Some of the materials companies (e.g. glass, LC, polarizers, LEDs) make substantial economic profits from their participation in the display industry by following the leading display companies
- Display companies should be able to share in some of this value by either
  - Co-investing with the established materials companies to secure supply and also realize equity upside
  - Creating their own technology substitutes in the materials space
  - Helping these materials companies correctly specify the materials at most appropriate cost for their proposed use

Potential positive impact

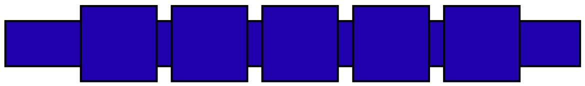
- In several categories of materials (e.g. glass, polarizers, CF, LC, optical foils, LEDs) there are substantial economic profits to be made which display makers should at least be able to participate in.
- There should also be scenarios in which 2nd tier materials businesses might be able to collaborate with display makers to establish more balanced value creation profile in the materials industry (reduce the power of companies such as 3M, Corning and Merck)

Issues to be overcome

- Potential initial resistance from the materials industry
- Display makers need to become much greater specialists in material science
- Display makers need to seriously consider how much additional value can be created in the next 10+ years before the TFT industry enters an "end-game" where holding additional assets in materials companies could be a great impediment

Seize some of the potential pot of value that is captured by materials companies today

Idea 3: Deployment of innovative factory approaches and new technologies



Hermetically sealed in line production equipment set designed for a specific product…

Mini-mills not large steel plants?

Rationale for change

- In the past, since the evolution of key products in the market was not clear, there was always greater value created by a generic large panel fab of as large substrate as possible – since mix could change according to market conditions and mix is one of the largest drivers of value in the large panel market
- However, clear market winning products have become more clear, and fab costs for large generic fabs have spiralled exponentially
- There may now be an opportunity for a hermetically sealed (hence not requiring a clean room) in-line, single product specific TFT fab solution that could substantially reduce capex/panel

Potential positive impact

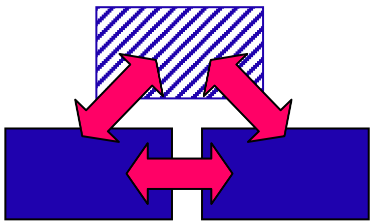
- Substantial potential reduction in capex/panel due to:
  - No/reduced clean room
  - None of the following equipment – interlocks, material movement robots
- Substantial increases in TACT time (and thus reductions in working capital locked up in TFT company)

Issues to be overcome

- Potential resistance from equipment makers who make a substantial portion of their business from transportation, handling and interlock systems

- Need to take on a completely new set of equipment risks?
  - Counter to the development of the industry to this date?

Idea 4: M&A or consortia based behaviour



Potential Gen 7 fab

Display Maker

Potential positive impact

- Mergers can create as much value as new fab investments without changing industry supply/demand situation plus the NewCo acquires new capabilities, new customers and new technologies

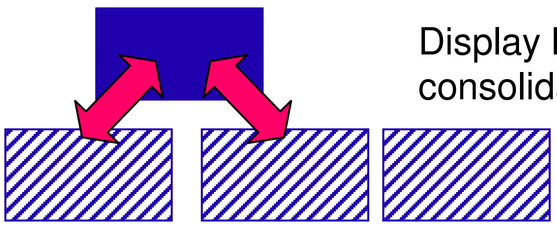
Rationale for change

- Mergers have been demonstrated to create as much value as a new fab investment without changing the industry supply/demand position
    - Additionally mergers allow companies to acquire new capabilities, new customers and new technologies; integration risks can be reduced through a detailed merger integration plan
- The potential sharing of new capacity would have the following benefits: reduced capital investment on a macro level – and greater demand sources for the fab; however, take or pay and other parental governance questions still need to be resolved

Issues to be overcome

- Mergers
    - Requires detailed merger integration plan and careful attention to HR/culture management issues
- Fab sharing (Production JV)
    - Governance framework is important (product design allocation, capacity sharing, take or pay contracts etc)

Idea 5: New business models to reinforce leading position of top tier players (Trader in semi-finished products, industry consolidator, new commercial models)



Display Maker acts as demand consolidator

Second tier Display Maker

Potential positive impact

- Allows the leading players to maintain their strong position in the market and to create a more rational, concentrated and hence more profitable market place
- Market openness options should lead to slightly higher margins (through improved mix) and reduced inventory obsolescence

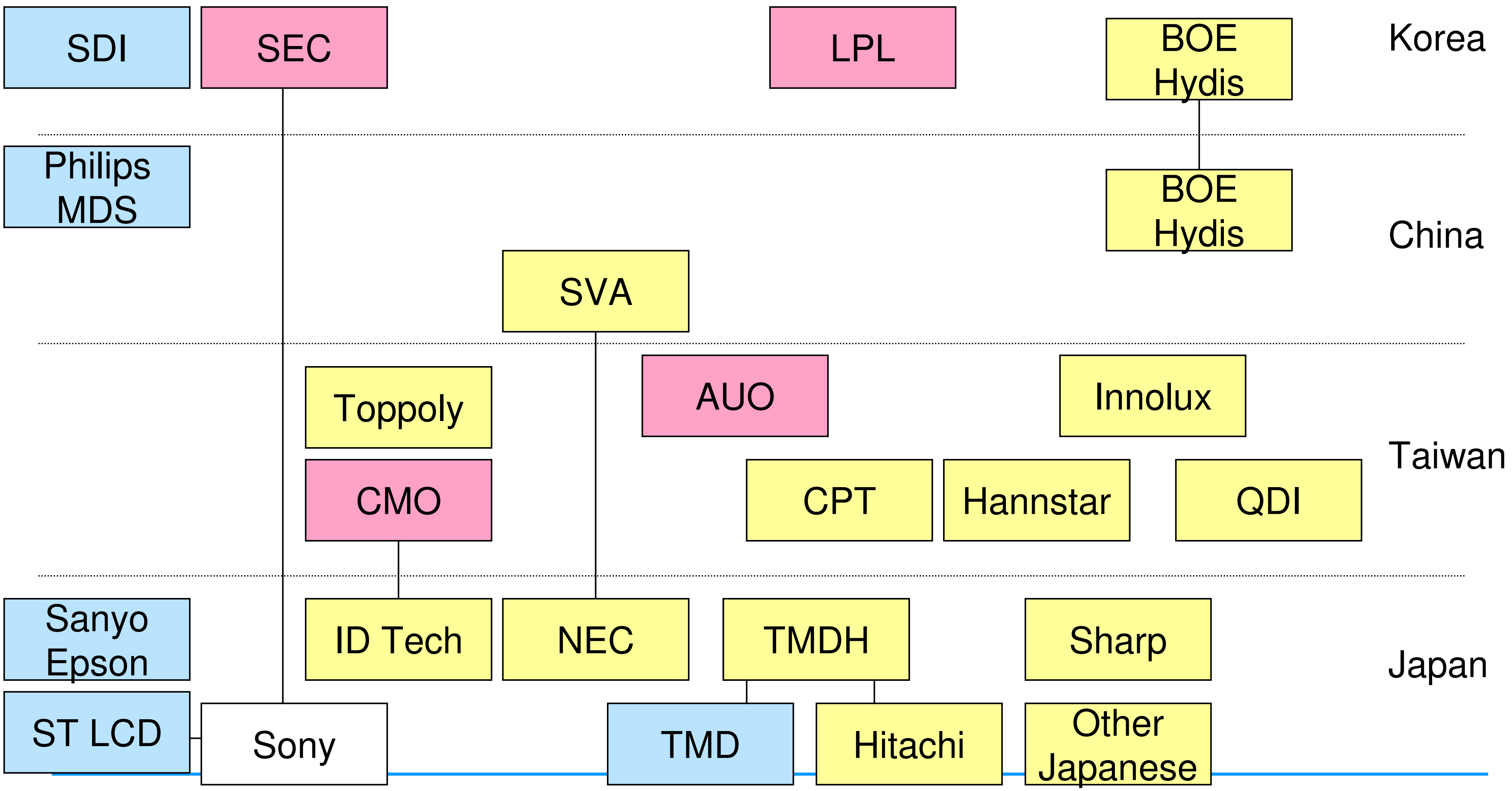
Rationale for change

- Typically leading TFT players compete based solely on their own assets – while there have been examples of product swaps to work about the questions of substrate limitations. However there should be options for the leading TFT players – the ones with stronger customer demand to buy arrays or cells from second tier firms – adding value in the module stage
- Moreover there should be additional opportunities in the following ideas:
    - Options to sell excess capacity on an organized spot market
    - Options to allow automated product swaps with other players
    - Pay small amounts to ailing display players to retire capacity instead of letting new Chinese players come into the market

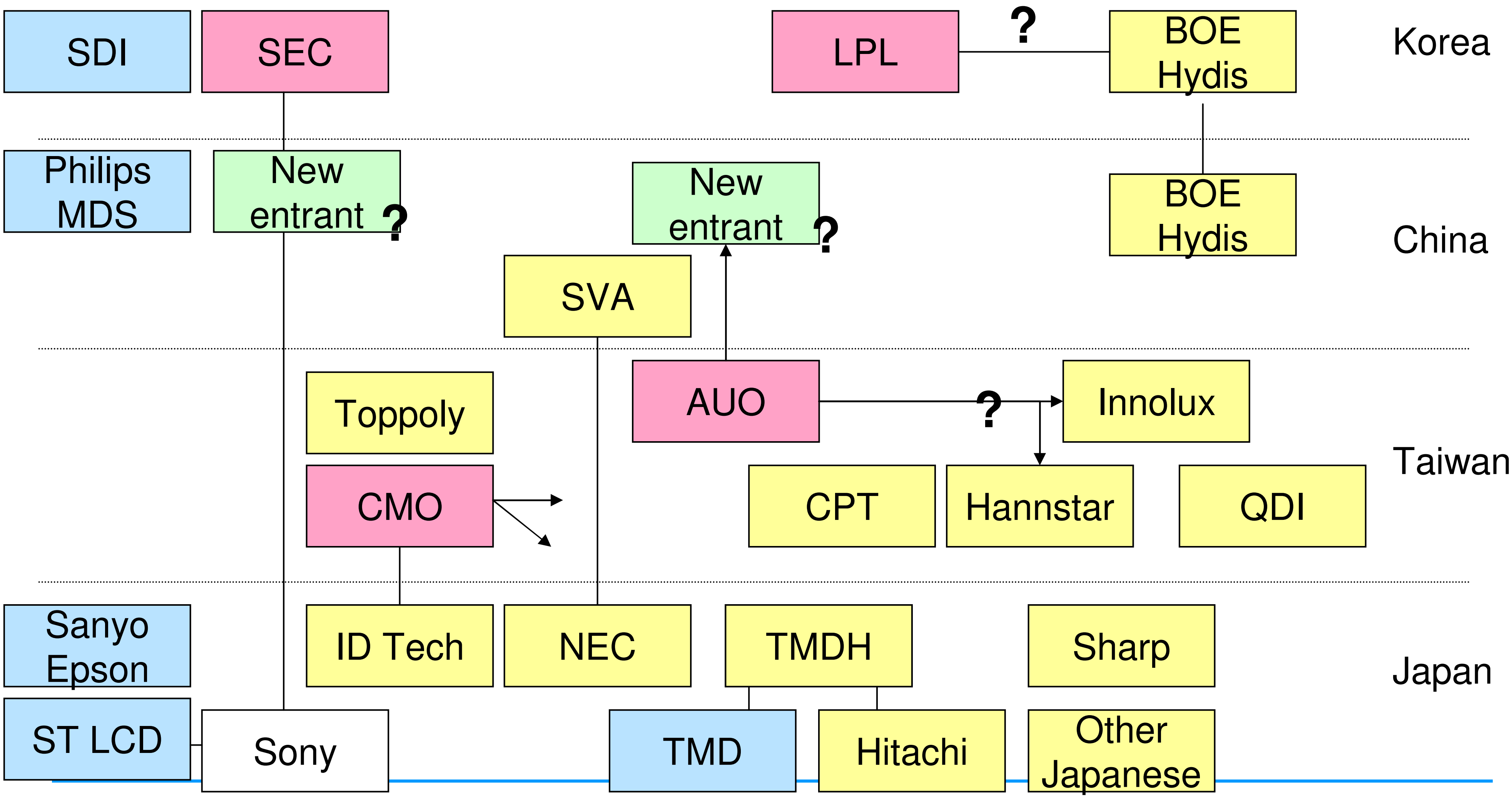
Issues to be overcome

- Some logistics and quality assurance problems to be overcome
- Some commercial issues – pricing for semi-finished product
- Need for some organization to play the coordinating role for the spot market, product swaps and capacity "smoothing" agent

Industry outlook (Today's leaders)

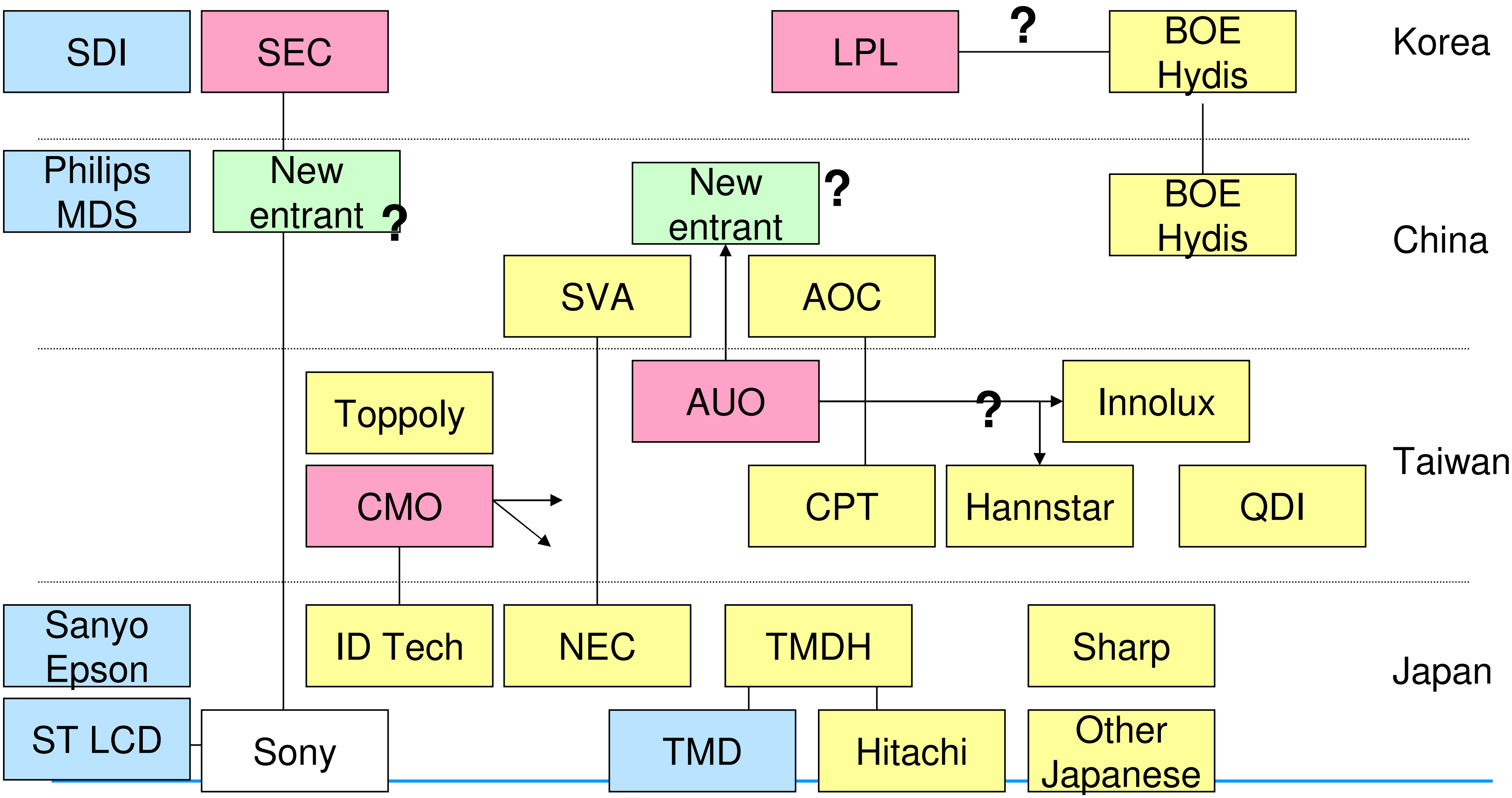


Industry outlook: Top tier players will control the capacity of smaller players and may co-invest with Chinese



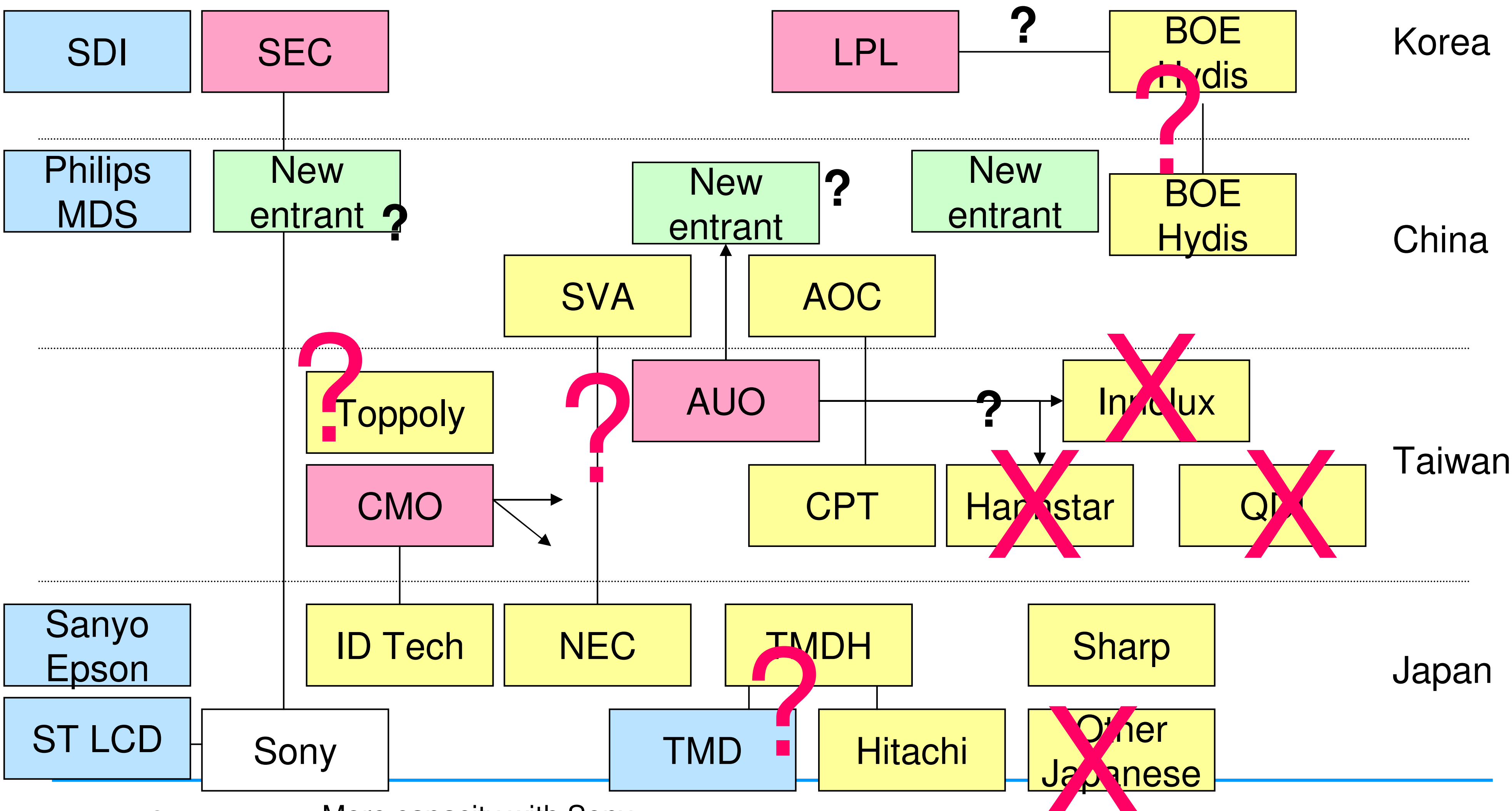
More capacity with Sony in S-LCD

Industry outlook: New business models may appear (e.g. forward integration for CPT)



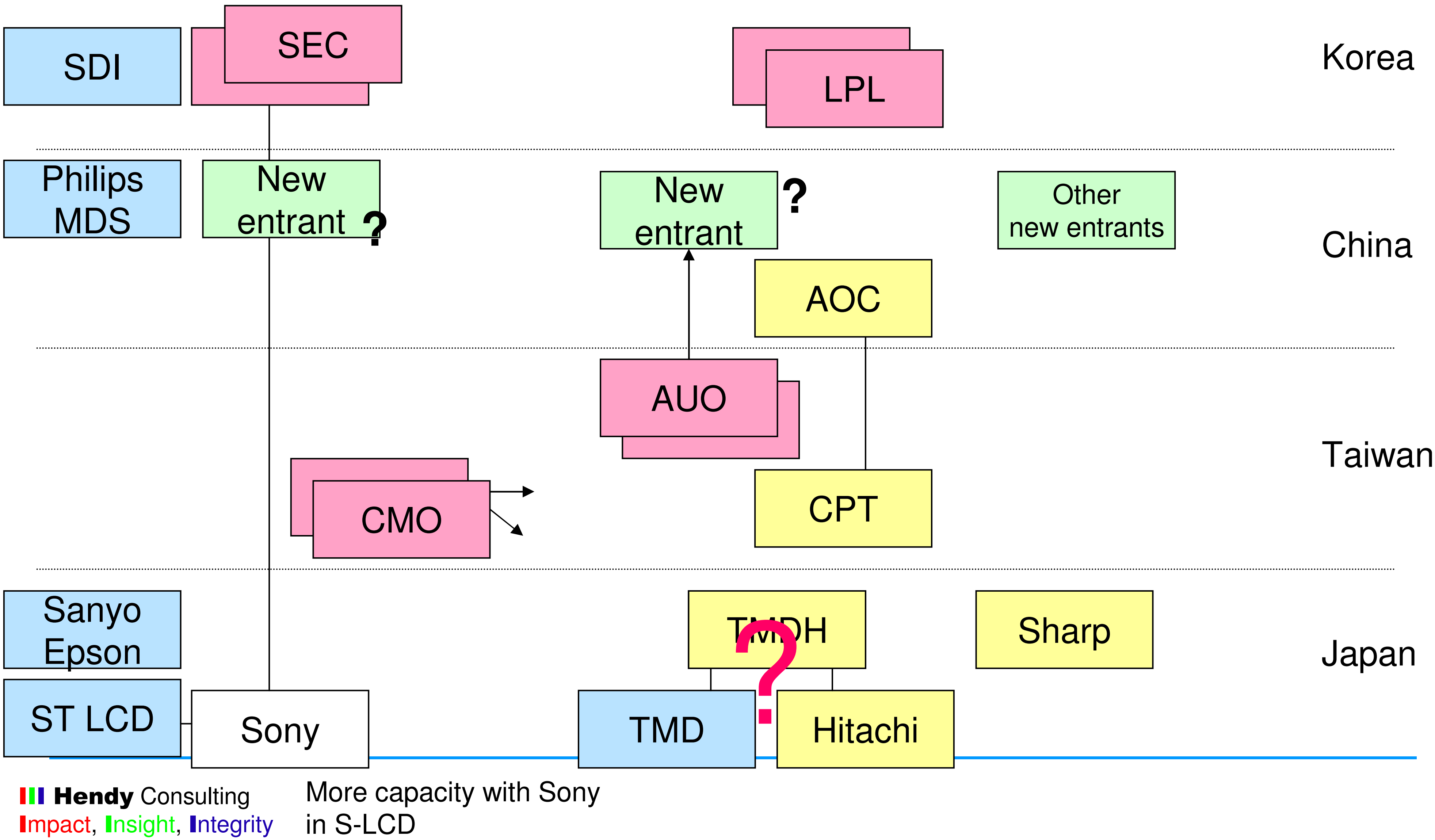
More capacity with Sony in S-LCD

Industry outlook: ..and if industry over supply continues, we will begin to see exits…



More capacity with Sony in S-LCD

Industry outlook: With the result being a smaller group of players



Summary

- With all of the capacity coming on line in 2005/2006 there is a material risk that the large panel LCD market will go into systemic oversupply
- Companies need to prepare for the oversupply by:
  - Reinforcing their relationships with their customers
  - Managing mix to being as optimal as possible
  - Continuous pressure on material cost downs especially in the TV space
    - Players need to realize that they are more and more in a materials business (capex/COGS is declining over time)

AND

- Considering new breakthrough ways to increase shareholder value without investing in additional capacity…
  - Forward integration
  - Rearward integration
  - Deployment of new equipment approaches
  - M&A/Consortium behaviour
  - New business models
- We expect the landscape of the large panel industry to change substantially over the next 2 years – the exact degree will depend again on barriers to exit and government subsidies and support (especially in Taiwan and China)