Displays in the USA

A strategic assessment for the US displays industry

January, 2011

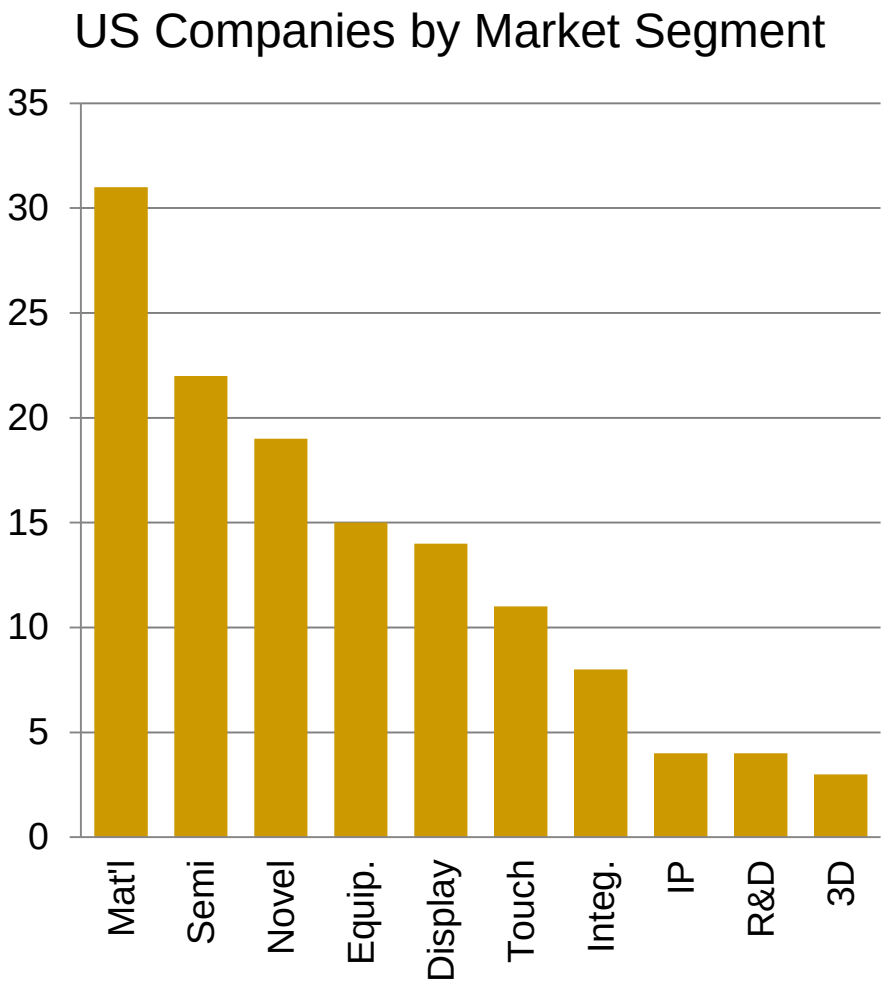
Executive Summary: Ten themes for the American display market

- The USA display market is around 100 different businesses competing in the display value chain.
  - Average revenues of $140m
  - Operating margins of around 20% for those companies that declare them
  - 3M and Corning skew the average, of course and so profitability levels of non-quoted firms is likely to be nearer break-even
- This presentation outlines the economics and drivers of these display players and contrasts them with their European counterparts. It explores the notion of a strategic marketing plan for the American display industry.
  - What can the USA do to incubate more materials related businesses?
  - How can American firms use Uncle Sam to bring them wealth and health that allows them the flourish while their counterparts in Europe flounder?
  - How can American firms harness the notion of customer intimate evolution that seems to be the successful formula when partnering with Asia?
- We believe that for the USA to make a step change in its position, more Fortune 500 firms need to support the agenda.
  - While the venture (VC) community has succeeded in fostering a range of IP licensing models, it is not clear that these have been financial wins.
  - Economic success will be tied to manufacturing and to innovating customer-intimate products.

What is the USA display industry?

- Businesses (or the revenue from larger groups directly related to displays) focused on the display industry or its supporting materials, equipment and IP.
- Flexible printed electronics for other applications (PV, Semiconductors) is not included. Professional integrators of display products are included (if the result is still primarily a display module), but not manufacturers of PC or TV products.
- We have included touch-panel and related component companies.
- Companies with a center of gravity (R&D, manufacturing or the HQ) in North America have been included. One Canadian company, Smart Technologies is included in the data but is listed in the USA
- The starting point has been those companies with at least 2 members of SID in the USA then bolstered with additional research.
- In this presentation we indicate the reported revenues by the public companies for the appropriate segment of their business, if this is available, or total company revenues if segment information is not given.

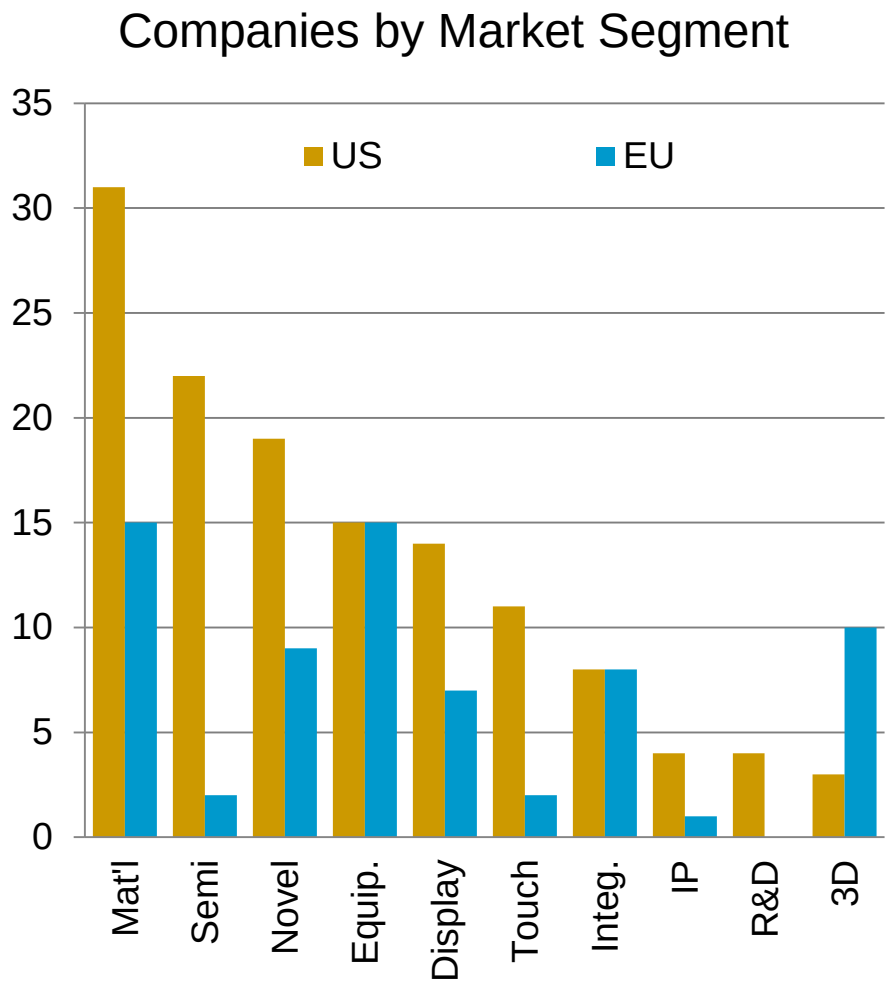
Profile of the USA display industry

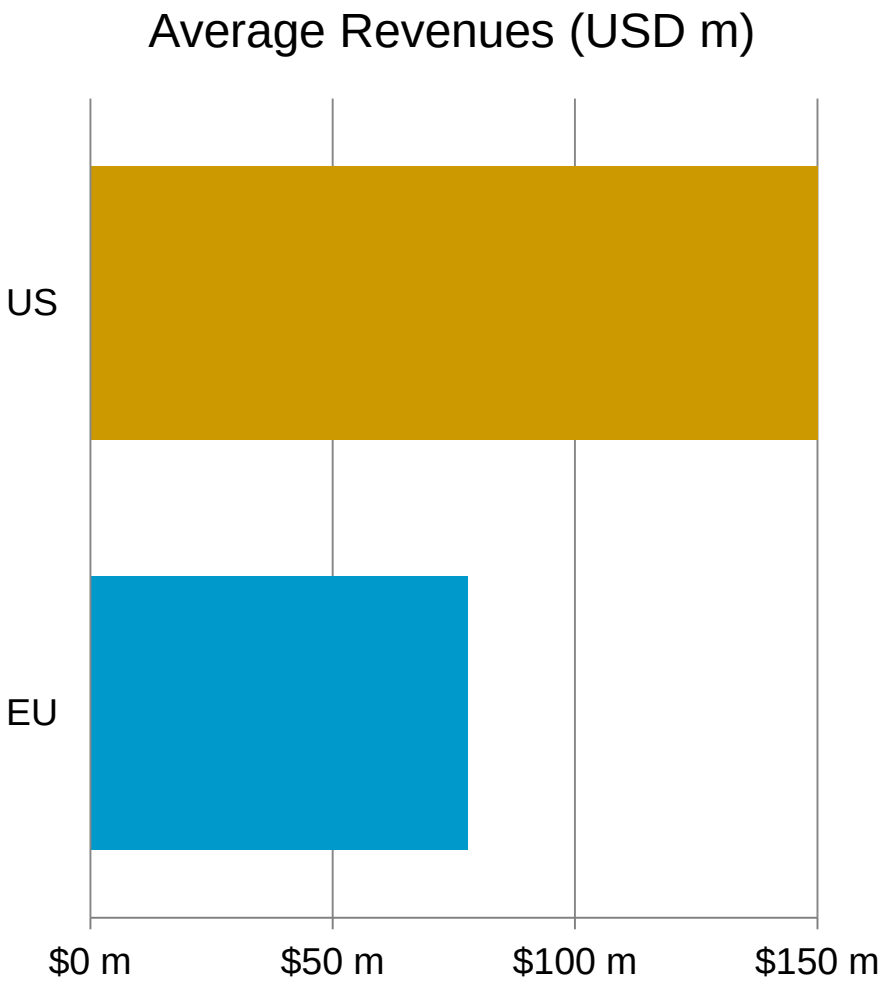


- Total of around $15b of display-related sales revenue
- More than 130 different businesses
- Around 30 firms with revenues > $100m
- Average revenue of $140m. This analysis is based on our estimate in each case of the relevant displays revenue
- Materials businesses constitute the largest constituency with semiconductor offerings in second place
- The large number of government research institutions and/or universities are excluded from this analysis but they often foster new market entrants

Source: analyst reports, company reports, text searches, Hendy Consulting analysis and many estimates.

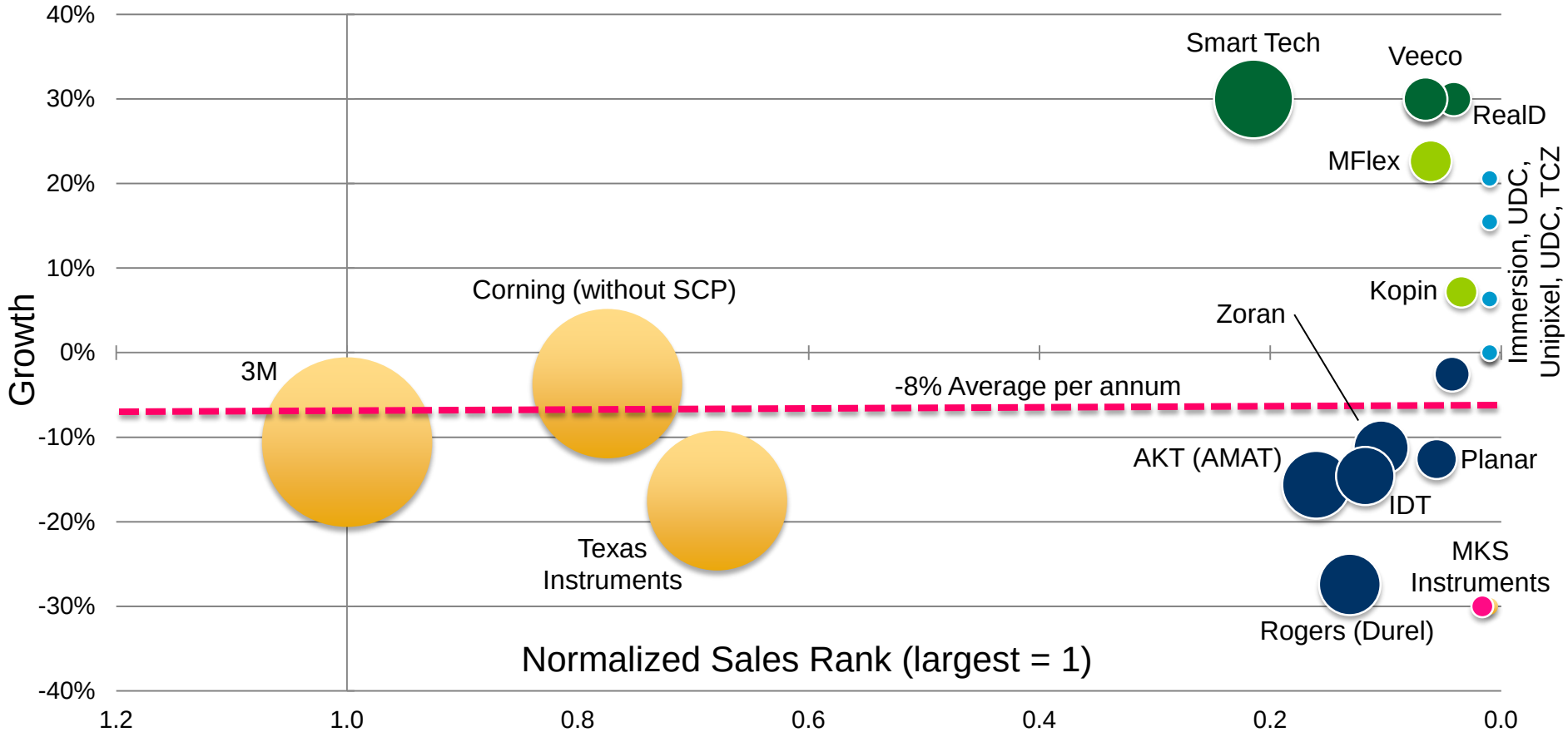
The US display industry has more materials and semiconductor firms than Europe does and these average twice the size





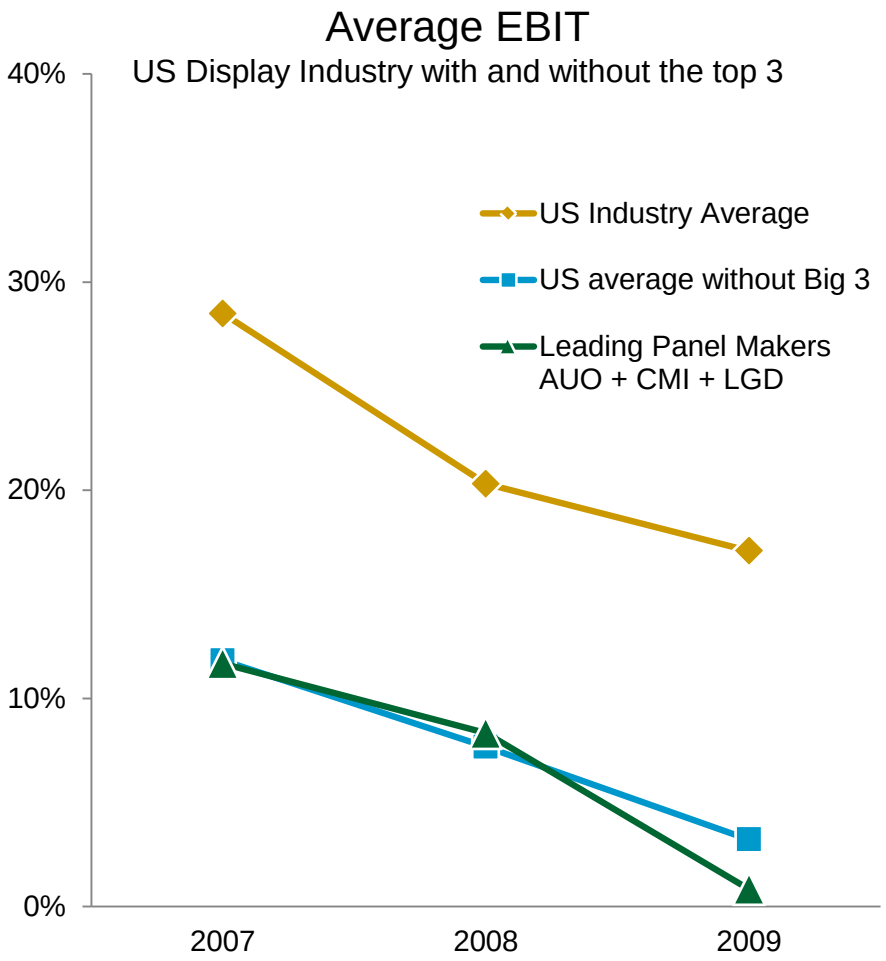
Source: analyst reports, company reports, text searches, Hendy Consulting analysis and many estimates.

Growth, sales rank and relative revenues (bubble size) show three giants dominate in the USA.
Average per annum growth 2007–09 was -8%.



Source: analyst reports, company reports, text searches, Hendy Consulting analysis and many estimates.

The average profitability declined 2007-2009 and it depends heavily on the inclusion or exclusion of 3M, Corning and TI



- We believe that the drop in profitability likely has many factors
  - Display cycle related: pattern here is similar to that for display companies in Asia
  - Increasing competition and expiry of patent protection for some businesses
  - Price falling faster than material cost
- It is clear that the Big 3 make a major difference to the USA display industry profit distribution.
- What is striking also is that the US display industry is more profitable than the European industry.
  - This is not just a function of 3 profitable players at the top.
  - The US has more mid-sized, profitable companies than Europe has.

Source: analyst reports, company reports, text searches, Hendy Consulting analysis and many estimates.

Key themes

1. Leaders maintain their position at the top of the list but they face different forces
2. Some successes in equipment and facilities. How can we foster more of these?
3. Microdisplays are a distinct USA phenomenon supported by military & industry apps
4. Innovation in touch: USA is a key player
5. Mixed messages for IP & Licensing businesses: do they ever return enough value ?
6. Understanding vertical markets can create opportunity, with enough technology
7. Novel materials: USA has done a fair job of fostering startups and some Fortune 500 are involved but more investment is needed
8. Semiconductors: Playing in the analog/power end of the display market seems a winning idea
9. Traditional companies new to the scene for flexibles
10. Investor disappointment with US flat-panel makers to date may lead to missed opportunities

Theme 1: Leaders maintain their position at the top but they face different forces

- If we look at the top 3 (Corning, 3M and TI), their positions are relatively unchanged but they face different commercial and technological forces.
- Corning maintains market dominance in glass through the technology and customer-centric model it has deployed from the start.
  - Customers compete by using larger substrates.
  - Customers need Corning to solve new problems continuously, which creates value opportunities.
- 3M, however, has seen its Display & Graphics sector margins erode.
  - Key patents for brightness films lapsed.
  - Customers fostered competitive alternatives to 3M as they beat CRT and traded cost for performance.
- TI's DLP business has had to switch from TV to cinema and pico-projector applications.

3M (Minneapolis MN):
Leadership in expensive optical films has eroded by the commoditization of low end LCD TV: it is clear that some consumers will accept a cheaper display system.

$4,000m Display and Graphics sales 2010e

Corning (Corning NY):
Productivity and technology have sustained 50%+ operating margins. The only real threats are coated soda-lime glass that might be used for cheap displays and cheaper alternatives to Gorilla Glass.
$3,000 Display Glass sales 2010e

Texas Instruments (Dallas TX):
TI has developed a strong niche position for its DLP-based MEMS display technology that may allow it to replace sales from rear-projection TV applications with sales from new pico-projector applications
Within "Other" BU sales $2,000m ('09)

Theme 1 (continued): We might also consider DuPont, Dow Chemical and Dow Corning in the leadership group

- DuPont is probably the Granddaddy of the USA Electronic Materials market, with a forecasted $2.5b of profitable (16-18%) sales to a broad range of end markets. Displays represent 7% of the total business, with DuPont offering thick film pastes for PDP, bonding solutions and OLED materials among others. DuPont has maintained its margins over a sustained period through market centric products.
  - Focusing next on adhesives and OLED materials for displays and lighting
- Dow has pursued aspirations in displays and electronic materials in general in a fairly sophisticated manner.
  - Investments in small display companies, especially in Europe through a Dow investment fund on top of direct offerings from both Dow and Dow Corning
- It is clear that the USA has a lot to bring to the table in display materials by bringing real depth in chemistry with strong field application competencies. We would like to see more US multinationals broaden offerings here to rival the likes of Samsung Cheil, LG Chem and Sumitomo Chemical.

DuPont:
About $200m display related sales, covering PDP pastes, OLED materials and others. DuPont has a diverse set of electronic materials and a strong field application organization
$2,500m Electronics & Comms sales 2010e

Dow and Dow Corning:
A multi-pronged approach to understanding the display market: direct investments and a Venture capital fund. Dow Corning also a key player in silicones and materials for adhesion/encapsulation with barriers.
Financials not disclosed

Theme 2: Some successes in equipment and facilities… How can we foster more of these?

- Federal stimulus channeled through the US Display Consortium (now FlexTech Alliance) in the early 1990s targeted equipment companies such as Photon Dynamics.
  - This made sense because tools and materials are key to developing differentiated processes.
  - But the breakeven volume for a tool platform is 30 or more systems. It was not economic to serve the special needs of novel technology start-ups.
  - Domestic equipment firms survived by serving Asian manufactures, not US ones.
- Retention of competitive process tool know-how has helped US entrants in the photovoltaic (PV) market more than in the display market.
- The challenge this decade and next is developing equipment and facilities capabilities that enable entry into flexible display or other electronics manufacture. That presupposes enough domestic capital spending to sustain domestic suppliers.

Applied Materials (Santa Clara CA):
After the crash in 1998, AKT built a powerful position supplying CVD gear to all of the LCD majors. The key business risk remains the copying and localization of AKT designs by Asian competitors.
$899m Display sector sales FY 2010

CH2M Hill (Englewood CO):
Has provided innovative clean room concepts to the Chinese TFT players. May have an opportunity to win regional orders from producers lacking in-house construction competencies. Total sales of $6,300m '09 and 16+ FPD projects to date

Photon Dynamics (San Jose CA):
Strong market position in TFT array test with LCD majors (LG Display was an early investor). It was less able to lever its imaging know-how and was acquired by the leading pattern inspection company.
$345m PCB + FPD sales in FY 2010

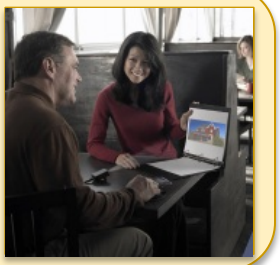
Theme 3: Projection displays are a pure USA phenomenon and Uncle Sam's support has been a critical success factor.

- Microdisplays and picoprojectors are purely American business models.
  - MED in the UK tried to execute on a polymer OLED microdisplay business plan but ran out of money and went bankrupt.
  - The support of Uncle Sam in providing market opportunities for military applications seems to be critical in making these businesses succeed.
- We are skeptical that the picoprojector phenomenon will succeed: the consumer value of the function is not enough to support the bill of materials and the impact on battery life in the host device may be too severe.
- It is clear however that eMagin and Kopin have put together mature and sensible supply chains that harness Asia and provide for US control points.
  - They provide examples of effective industrial strategy in the context of military demand.
  - Other projection display ventures failed.

Kopin (Tauton MA):
An MIT spin-out in 1984, Kopin developed III-V semiconductor capability that supported microdisplays. It grew into a $100m company with half its sales from military and other cyber displays.
$110m Sales in 2010e

eMAGIN (Bellvue WA):
Evolving from FED, a member of the American Display Consortium in 1992, acquiring Virtual Vision in 1998 and being acquired in 2000 to become eMagin, the firm has a $25m business in OLED today.
$28m in sales in 2010e

Microvision (Redmond WA):
Has diversified into bar code scanners as well as MEMs-based laser projectors for heads-up vehicle displays (e.g. with Pioneer) with investment from Walshin Lihwa, former parent of Chi Mei Opto.
$5m in sales in 2010e



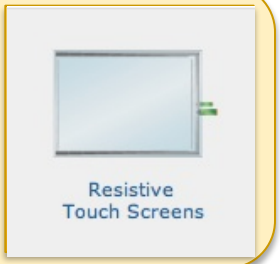
Theme 4: The USA has built up a strong position in touch and user interfaces despite competition in Japan and Taiwan

- The US has built quite a position in touch and UI, by understanding that touch is more than its parts, touch is about understanding customer usage scenarios, especially in vertical markets.
- The presence of domestic semiconductor design and foundry expertise supports experimentation and development.
- Asian firms benefit from similar regional capabilities and their semiconductor suppliers benefit from even closer ties to leading display makers.
  - A number of LCD driver designers in Asia have branched into touch panel components.
  - Leading LCD makers will integrate more touch value. They may use regional supply chains.
- While display makers themselves, and suppliers like Japan's Nissha ,will continue to be formidable competitors, US players may continue to make their 10-15% operating profits by focusing on applications and customer insights.

Tyco Electronics (Berwyn PA):
Elo TouchSystems started in 1971 with resistive technology. Raychem acquired it in '86 and it combined with Carroll Touch Systems as part of Tyco in '99. The BU manages a wide portfolio of solutions today. $392m touch sales in 2010

Synaptics (Santa Clara CA):
Has diversified from touchpads for PC notebooks into touch components for handheld mobile devices that account for nearly one-half of sales. Synaptics has maintained decent margins in the process. $515m touch sales in 2010

Touch International (Austin TX):
A private touch screen firm demonstrating the value of customizing solutions to the needs of specific multi-touch problems using resistive or capacitive technologies. DMC Co. of Japan provides mfg services. $250m touch sales 2010e

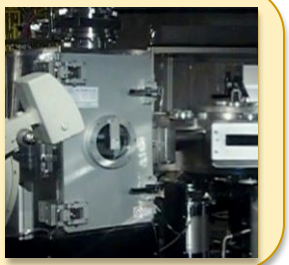


Theme 5: Mixed messages for IP and licensing businesses in the display space

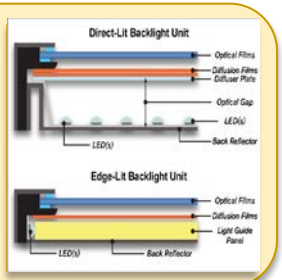
- Venture capitalists seemingly like exposures in IP and licensing businesses, but the exits have not provided the expected upside in displays.
  - Trade exits seem to be the way that things go and single industry purchasers have not provided the numbers sought.
  - The display industry in general, and Korean firms in particular are leery of large ongoing royalties. They prefer to purchase the IP owner or find ways around the patents.
- The last few years have seen the sale of Kodak's OLED IP to LG, of CDT (Cambridge, UK) to Sumitomo and the sale of UniPixel's TMOS display IP to Rambus. None of these have been a huge win for the respective investors.
- Investors in E Ink were able to obtain a better exit but they had to wait a decade. It seems preferable to plan for faster exits even if markets develop slowly.

UDC (Ewing NJ):
Universal Display started with OLED IP from Princeton in 1992 and it remains the lone US independent in this space. UDC promotes phosphorescent materials through more than 30 JD partners worldwide.
$30m sales with $20 net loss in 2010e

Vitex Systems (formerly in CA):
Spun-out of Batelle (BMI) in 1999 to exploit barrier film IP, Vitex shifted gears in 2006. It stopped production efforts and started IP licensing efforts. Rumors suggest its IP was acquired by an Asian firm.
Private company, acquired in 2010?



Rambus (Los Altos CA):
Beginning with RDRAM device IP in 1990, Rambus has amassed 1000 patents. The TMOS display IP of Uni-Pixel was added to its lighting technology list in 2010.
$325m of total IP income 2010e having just acquired the new display related IP



Theme 6: Understanding vertical markets can create opportunity, with enough technology

- US firms have opportunities in military and aerospace than companies in other countries do, but such markets are cyclical.
- Big contractors such as Honeywell or Rockwell Collins benefit from thick portfolios of display and material technologies. They lead in flexible electronics, already.
- Smaller contractors live from project to project by integrating rugged display systems.
- Planar lacked the vertical market expertise to lever its early display lead as a specialist in EL (from Sarnoff). Though it remains small by Asian standards, Planar has weathered many sea changes in US policy.
- NDSsi has enough hardware and software to automate hospitals with wireless imaging.
- Video Display levers its cash-cow CRT business to expand in FPD through focused subsidiary companies specializing in apps.

Planar (Beaverton OR):
A spin-out of Tektronix in 1992, the firm abandoned a military-centric business model in 2000. Since then, it has acquired and sold several lines of business to remain the oldest surviving domestic player.
$176m sales FY 2010

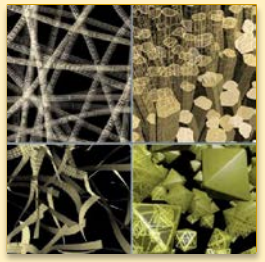
NDSsi (San Jose CA):
This surgical imaging company founded in 1996 acquired the DOME medical line from Planar in 2008. Added to the mix of PACS hardware and software, the display line automates wireless imaging in hospitals.
Private company

Video Display (Tucker GA):
Starting with CRT mfg in 1975, VIDE has acquired several small FPD businesses to keep its military and industrial capability competitive. It remains profitable as FPD-related products contribute more to sales.
$50m of display sales in FP 2010

Theme 7: A number of novel material start-ups, but it would be nice to see more Fortune 500 players at the table

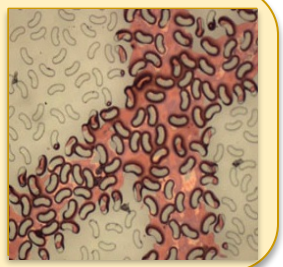
- Spin-outs and start-ups often succeed at innovating and often fail to profit from scale.
  - In most cases, demand comes from Asia where larger organizations offering continuous support are expected.
  - In other cases, demand depends on other innovations in the US or Europe. Time to market (money) can be very long.
- Many innovators believe their materials will replace incumbent ones but that often proves to be unrealistic.
  - New materials more often enable new processes or products (e.g. Uni-Pixel).
  - Developing new processes often requires resources of larger firms, hence acquisitions.
- Large US firms such as 3M, Corning and DuPont have profited in materials. Deep pockets are needed to survive slow market development.

Cambrios Technologies (Sunnyvale CA):
This 2002 MIT & UC spin-out succeeded in selling nanomaterials to Nissha, a leading touch panel maker in Japan, and obtaining federal agency grants for transparent conductive film used in SSL and PV.
Private company



QD Vision (Watertown MA):
This 2004 MIT spin-out promises quantum dots as alternatives to conventional LED for lamps or displays. It has a JD agreement with LG Displays, the #2 AMLCD maker, for backlight applications.
Private company

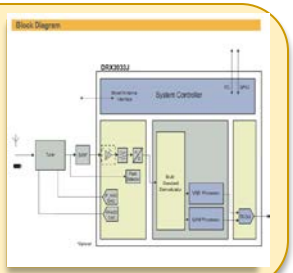
UniPixel Displays (Woodlands TX):
This firm began as Tralas Technologies in 1988, intent on developing an alternative to LCD using TFT backplanes. That proved difficult, so the firm re-invented itself as a maker of functional and conductive films.
2009 revenues of $0



Theme 8: Playing at the power-analog end of the display semiconductors business seems to make for an attractive strategy

- Several early US leaders in scalers and controllers for LCD monitors or TV sets have been consolidated. All face strong Asian competitors, such as MediaTek and MStar. Margins remain under pressure.
  - Broadcom acquired former ATI line from AMD and leverages its position in wireless components.
  - Trident Microsystems has responded by acquiring product lines from Europe (NXP most recently).
  - Zoran acquired the STB company Microtune and continues to compete with the larger firms.
- However, it seems that there is still a semiconductor opportunity for companies making LED drivers for backlighting, timing control or for other analog functions.
  - These niche players often compete well.
  - They may profit more than glamour companies do in larger market segments.

Trident Microsystems (Sunnyvale CA):
A pioneer in display processing since 1987, the firm countered Asian competitors by acquiring the TV-related chip line of Micronas (Swiss) in 2009 and of NXP (formerly Philips Semiconductors) in 2010.
$580m sales 2010e



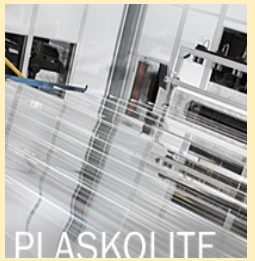
ON Semiconductor (Phoneix AZ):
Spun-out of Motorola in 1999, this firm acquired California Micro Devices in 2010 including power supply and filtering IC for LCD applications. It also acquired Sanyo Semiconductor with a line of video chips.
$750m standard product sales 2010e

Supertex (Sunnyvale CA):
A focused specialty high-voltage IC company founded in 1976 has grown a product line of LED drivers for LCD backlight and lighting applications
$15m LED/lighting related sales FY 2010

Theme 9: Traditional companies are beginning to come to the table for flexible displays and electronics

- Evolution of mass markets for flat panels have led traditional materials companies to enter.
- We are pleased to see medium-sized firms find ways to serve display needs by providing protective films, sealants or other specialty items.
  - Their success proves US firms can compete if they provide apps support and secure supply, especially to domestic brands or OEM producers.
  - They may also succeed by extending such capabilities into solar (PV) applications.
- In addition, a number of US firms in the “converting” business have attended conferences on printable electronics. There may be many regional market niches for novel packaging or advertising apps.
- Larger firms with global reach such as (TG) Tredegar have levered Asian presence to serve demand for TV screen coatings.

Plaskolite (Columbus OH):
Founded in 1950, this firm expanded its acrylic (PMMA) and polycarbonate product range by acquisition to serve needs for protective films used in mobile phones, GPS devices, etc.
Private firm of 450-500 employees



Tredegar Film Products (Richmond VA):
The parent company, Tredegar, is a leader in conventional plastic films and aluminum extrusions that has expanded into China. The films unit developed a product line for protecting LCD screens, such as TV sets.
$450m of current films business 2010e

Carestream Advanced Materials (MN):
This unit of Carestream Health, the former Kodak medical business, levers R2R web capabilities to offer silver-coated conductive films for flexible electronics applications. It has tech centers in China, Italy and the US.
Privately owned firm

Theme 10: Disappointment with flat-panel makers may lead to missed opportunities next decade as flexible tech emerges.

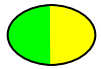
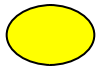
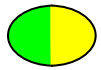
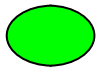
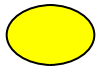
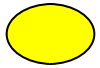
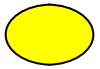
- We figure 13 display makers survive in North America out of a historical population of 72 companies: less than one in five.
- Surviving companies or business units are small compared to Asian counterparts. Sales are reckoned in millions, not billions.
- Large industrial firms either abandoned the display market, or spun-out ventures.
  - GE, Honeywell and others quit.
  - RCA/Sarnoff, National Semiconductor, Tektronix and others spun-off ventures.
- Venture capitalists funded firms for five to ten years in most cases.
  - US start-ups burned venture funds far longer than European firms did.
  - Even successes such as E-Ink took ten years to come to fruition.
  - VC now seem reluctant; once burned...

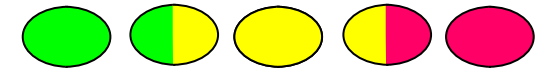
Kent Displays (Kent OH):
Developed and defended IP in Cholesteric LC displays since 1993 but remains a small private company. Finding signage a slow-growing business, it created a consumer product division for “boogie board” in 2010. Private; about 75 employees

Micron Technology (Boise ID):
Entered FED market but sold IP to PixTech in 1999 after seven years of investment. The company re-entered the display market by acquiring Displaytech, one of several disappointing LCOS ventures, in 2009. Relevant sales not reported

Qualcomm (San Diego CA):
Acquired Iridigm’s MEMs (a 1995 start-up) venture in 2004 and nurtured development of Mirasol displays. Recent investments in Taiwan may provide needed scale for entry into the tablet display market. MEMS/QMT BU revenues not reported

Summary: Top opportunities in the US display industry are those that supply material, equipment (case by case), Uncle Sam or that have special market insight

		Size and growth of profit/value opportunity	Current USA competitive position → Potential competitive position	Key competitors	Key developments needed	Summary
HIGH	Materials (Glass, Plastics, Process Chemicals, etc.)		 	Asia dominates except in glass	More protracted effort and CapEx by large companies	Top opportunity
HIGH	Illumination, Optics & Films (Including optical films)		 	Asia dominates commodities	More CapEx and regional design or applications centers	Solid opportunity
MID	Process Equipment			Asia (Dominant) USA has AMAT	Small in-line fabs become economic	Speculative opportunity on a case by case basis
MID	System Integration for special needs (e.g. Military) and Touch/UI		 	Asia (mainstream integrators)	Concentration and market focus; clean manufacturing tech.	Good market opportunities with high growth in touch/UI
MID	Display Drivers, Image Processors and Interface ICs		 	Asia dominates commodities	Leverage lead in signal processing, wireless and analog	Some opportunities in those segments that do not compete directly with Asia
MID	Contract R&D plus IP Licensing		 	Asia (e.g. SEL) EU consortia	Plan exits sooner or find domestic partners	Opportunity, but are the returns high enough given the risks?
LO	Display Production (core manufacturing)		 	Asia (Dominant)	Domestic green mfg infrastructure and alternative materials	Innovation might create new markets but tough to compete



Positive attribute Negative attribute

USA track record in complete display systems is poor with business going under or assets being transferred from one owner to the next: *List of businesses closed or sold in the last decade*

Firm	Tech.	End	Disposition
Alien Technology	Backplanes	2000	Switched to RFID market
FED	FED	2000	Merged into eMagin; OLED
Motorola	FED	2000	Impaired
Uniax Polymer Electronics	OLED	2000	Acquired by DuPont > Solutia
Colorado MicroDisplay	Proj-LCD	2001	Banktuptcy > Three-Five
Digital Reflection	Proj-LCD	2001	Bankruptcy
inViso (formerly Siliscape)	Proj-LCD	2001	Bankruptcy
Lite Array	TFEL	2001	Acq./Liq. Global-Tech. '02
Advanced Display Systems	ChLCD	2002	Bankruptcy
Crystaloid Technologies	PMLCD	2002	Asset sale > Elecsys
Display Research Labs.	VFD	2002	Faded away after law suit
PixTech	FED	2002	Bankruptcy
ImageQuest Technologies	AMLCD	2002	Liquidated
Lightware LCD	Proj-LCD	2002	Acquired by PLUS Vision
Retinal Displays	Proj-LCD	2003	IP sold to SBG
Sarif	Proj-LCD	2003	Liquidated
Three-Five Systems	Proj-LCD	2003	Spun-off Brillian; Bankruptcy
Candescent Technologies	FED	2004	Bankruptcy; > Canon
Hana Microdisplay Tech.	Proj-LCD	2004	Exited LCoS market
Iridigm	MEM	2004	Acquired by Qualcomm
FlexICs	Backplanes	2005	Liquidated
Gyricon Media	EPD	2005	Liquidated
Rainbow Displays	AMLCD	2005	Liquidated
Stellar Display (Kypwee)	FED	2005	shell company?
Brillian	Proj-LCD	2005	Merged into Syntax-Brillian
Reflectivity	MEM	2006	Acquired by Texas Inst.
Clarity Visual Systems	Proj-LCD	2006	Acquired by Planar Systems
MicroDisplay	Proj-LCD	2007	Liquidated
Steridian	Proj-LCD	2007	Liquidated
LXD	PMLCD	2008	Went to China after 23 years
Silicon Light Machines	MEM	2008	Acquired by DNS
SpatiaLight	Proj-LCD	2008	Bankruptcy
Telegen	VFD	2008	Re-org'd as VU1, near death
iFire Technologies	TFEL	2008	Acquired by CTS Group
Syntax-Brillian	Proj-LCD	2008	Bankruptcy
Actuality Systems	3D Displays	2009	Acquired by Optics for Hire
Displaytech	Proj-LCD	2009	Acquired by Micron Tech.
E-Ink	EPD	2009	Acquired by PVI > E Ink
Luxell Technologies	TFEL	2009	Bankruptcy > Private
Uni-Pixel (formerly Tralas)	TMOS	2009	IP sold to Rambus; films now
Aurora Systems	Proj-LCD	2010	Acquired by Omni V

Two lessons emerge from our review of US display industry disappointments since the 1970's

- Developing regional apps support in key markets is more important than most start-ups realize. Using representatives creates leakage paths for know-how, weakens management relationships and hampers learning.
  - If field engineering looks too expensive, rethink the plan.
- Consider dependencies and downstream developments. A complete value chain is needed for commercialization.
  - For example, Apple did not invent the tablet, they were just the first to create the needed environment for it. If you can't create it, don't bet on it.

Summary: The US market gives entrepreneurs some clear breaks when it comes to building display businesses, but we need more Fortune 500 investment

- The nature of NASDAQ listings and US technology investor expectations allows small display businesses to accumulate much larger losses and survive longer pre-revenue periods than would be the case in Europe or Asia. This is the good news for those firms that get far enough that they can consider a listing, but firms need to deliver positive cash flows earlier.
- The ability for firms to tap revenue streams from the US Military or the DoE is another lifeline.
- The size and scale of the US venture capital industry is also a positive, but some of the larger firms have started casting their eyes oversees (for example Oak Investment Partners and Tudor Investments in Plastic Logic). Does this mean that there are not enough US small companies worthy of investment?
- Government policy however has largely failed to make a difference: while bodies like FlexTech Alliance (formerly USDC) have delivered new innovations and funded companies such as Photon Dynamics survived long enough to be acquired, real successes have been few and far between.
  - Assets and people have flowed from one company to another through rounds of creativity and bankruptcy.
  - We perceive two root causes: (1) The lack of emphasis on commercial and industrial strategy and; (2) the lack of participation by Fortune 500 companies on the whole.
  - We believe that for many of the display opportunities, start-ups need to be able to directly access Asian partners and build field operations. Multinationals are often better positioned to do this. Building a display business means crossing a very real chasm, even despite VC investors or NASDAQ listings.

Summary of sector strategies:
We believe that the following strategies are important to delivering value in the display world

Markets	Strategies
Materials lights and optics	Material start-ups should follow a disruptive path, concentrating on specialty applications then expanding into mainstream ones. New materials require new processes, which makes them risky and costly relative to incumbents in mainstream.
Equipment	Developing strong field engineering teams and senior management relationships has been important. So too, has been willingness to say no to unusual, uneconomic domestic requests. Look to transfer capabilities to related markets.
Applications & Integration	There is value here for US multinationals competing for global consumers and for US domestic firms understanding US vertical markets: understanding the customer is key.
Display Mfg	Making displays is a long, hard road: look for ways to recast the business plan as a narrower materials play with an option to extend into displays when funding is ready.
R&D / IP	Contract R&D or licensing businesses should seek exit paths earlier. Mass market development often takes longer and needs larger budgets than expected.
Semiconductors	Seek out niche opportunities based on advantages in analog or mixed signal capabilities, dodging the fields where Asian majors play.

Closing Remarks:
…and we are here to help with display business expertise

Growth strategy	Performance improvement	Equipment and Capex	Sourcing strategy (Purchasing)
• Market entry strategy • Business unit strategy • Growth strategies for new technologies	• Product portfolio management • Cost reduction • Forecast checks	• LCD/OLED factory capex decisions • Strategies for equipment makers	• Sourcing strategies, especially LCD and medical detectors • Make/buy decisions

Technology strategy and technology assessment	Partnering and alliances	Professional advisory and business planning	Strategies for materials providers
• Market and commercial strategies for new technology businesses • Market tracking services for corporates monitoring technology	• M&A candidates and assessments • Alliance formation support • Post merger integration planning	• Specialist insights for bankers, equity investors and other consultancies • Reviews of business plans and models	• Strategy support for materials providers in the FPD, SSL, and PV markets • IP and pricing plans

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