

The State of the Touch-Screen Panel Market in 2011

Each touch technology comes with its own strengths and weaknesses, a situation that is providing many differentiation elements for touch-screen panel makers. The cost competitiveness, profitability, and customer acceptance of the different technologies will become increasingly important as competition intensifies.

by Duke Lee

FOR the first 30-plus years of its existence, the touch-screen panel (TSP) industry was focused on specialized touch devices such as ATMs, kiosks, point-of-sales terminals, and industrial controls. In the early 2000s, when the industry first began expanding into consumer-electronic products such as personal digital assistants (PDAs) and personal navigation devices (PNDs), touch started attracting more attention. Growth prospects were diminished somewhat when the PDA market started to contract in 2003, but the TSP industry continued to grow while remaining focused mostly on small- and medium-sized niche markets.

As is well-known, the transformative event was the launch of the Apple iPhone in 2007. The iPhone's projected-capacitive (pro-cap) touch-screen panel drove the TSP industry to finally move beyond the application of traditional touch technologies in those small- and medium-sized markets. As global brands such as Samsung and LG Electronics radically expanded the use of touch in their products, the TSP industry began to be more investment-driven. And as market growth accelerated, a very high capability in touch technology came to be considered a basic competence. In addition, the ability to consistently supply very large quantities of touch-screen panels (ensured through the development of

increasingly large manufacturing capacities) became important. These characteristics indicated that the industry was changing from technology-intensive to capital-intensive.

By 2009, supported by this market ambience, component subsidiaries of large corporations were fully participating in the TSP industry and LCD panel makers were suggesting roadmaps for the development of integrated touch technology. Together with first-tier and second-tier LCD panel makers, companies specializing in LCD color-filter manufacturing (suitable fabs for glass-based pro-cap sensors) were executing aggressive investment plans for TSP capacity expansion.

This extremely rapid TSP-industry ramp-up occurred because all three components of the mobile-handset value chain (hardware makers, communication service suppliers, and consumers) simultaneously showed a radical increase in recognition of the value of touch. The market grew rapidly because all three value-chain components were able to demonstrate the ability to add value through the inclusion of touch. This growth is expected to continue in the future.

Touch technology can be applied regardless of the size or type of display. Each touch technology (*e.g.*, resistive, capacitive, surface acoustic wave, infrared, camera-based optical, integrated, *etc.*) has its own strengths and weaknesses; this provides many variations and differentiation elements for TSP makers. The cost competitiveness, profitability, and customer acceptance of each touch technology

will become increasingly important in markets with intensive competition. Since each technology has different strengths and weaknesses, it is likely that a hybrid or an entirely new type of touch technology will expand the market.

TSP Demand Forecast

Displaybank forecasts that the total TSP market will achieve a 36% CAGR (compound annual growth rate) in revenue and 42% CAGR in units through 2014. The total TSP market size of \$4.58 billion in 2010 is expected to grow to \$6.09 billion in 2011 and to \$9.65 billion in 2014, as shown in [Fig. 1\(a\)](#). This revenue growth corresponds with unit growth from 494 million TSP units in 2010 to 665 million units in 2011 and to 1.35 billion units in 2014, as shown in [Fig. 1\(b\)](#). Clearly, the TSP market is expected to show continuous growth in revenue, units, and area. Displaybank sees the primary reason for the growth as the continuously increasing penetration of TSPs into smartphones, touch-enabled feature phones, netbooks, and tablets.

Major TSP Applications under 10 in.

Out of the total 1.36 billion mobile phones expected to be sold in 2011, 31% (420 million) are expected to be touch-enabled. Penetration is expected to grow to 50% in 2014 (800 million units out of 1.6 billion total). [Figure 2\(a\)](#) shows this forecast in more detail.

In scoping the universe of mobile devices under 10 in., Displaybank uses two main cate-

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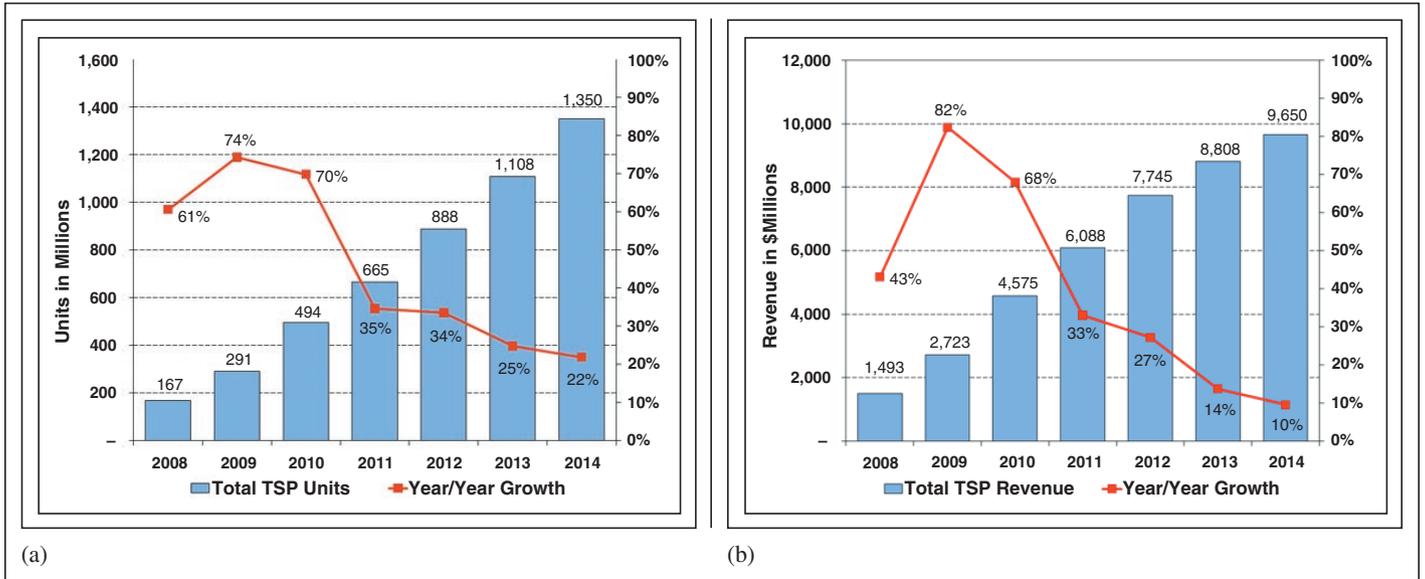


Fig. 1: Touch-screen-panel worldwide (a) units and (b) revenue are forecasted to show year-over-year growth from 2008 to 2014. Source: Displaybank Touch-Screen Panel Market and Issue Analysis, March 2011.

gories: mobile phones and “smartbooks.” The latter category is defined as a device with the functionality of a smartphone (*i.e.*, 3G, WiFi, GPS, instant-on, all-day battery life, *etc.*), a 5–10-in. screen, a clamshell or slate form factor, an ARM-class processor (not x86), and a Linux- or Chrome-class operating system (not Windows). Smartbooks therefore include

the majority of tablets likely to be launched in 2011 and most e-book readers, but not most netbooks, since they largely run Windows.

In 2011, Displaybank expects total smartbook shipments to be 84 million units. Out of this total, about 66 million smartbooks (80%) are expected to include touch. Figure 2(b) shows this forecast in more detail. Even

though the total number of units with touch is much greater in mobile phones (420 million), the average screen area of a smartbook is more than four times larger than that of a mobile phone. As a result, 2012 will be the year that the total area of smartbook TSPs will exceed that of mobile phone TSPs, as shown in Fig. 3.

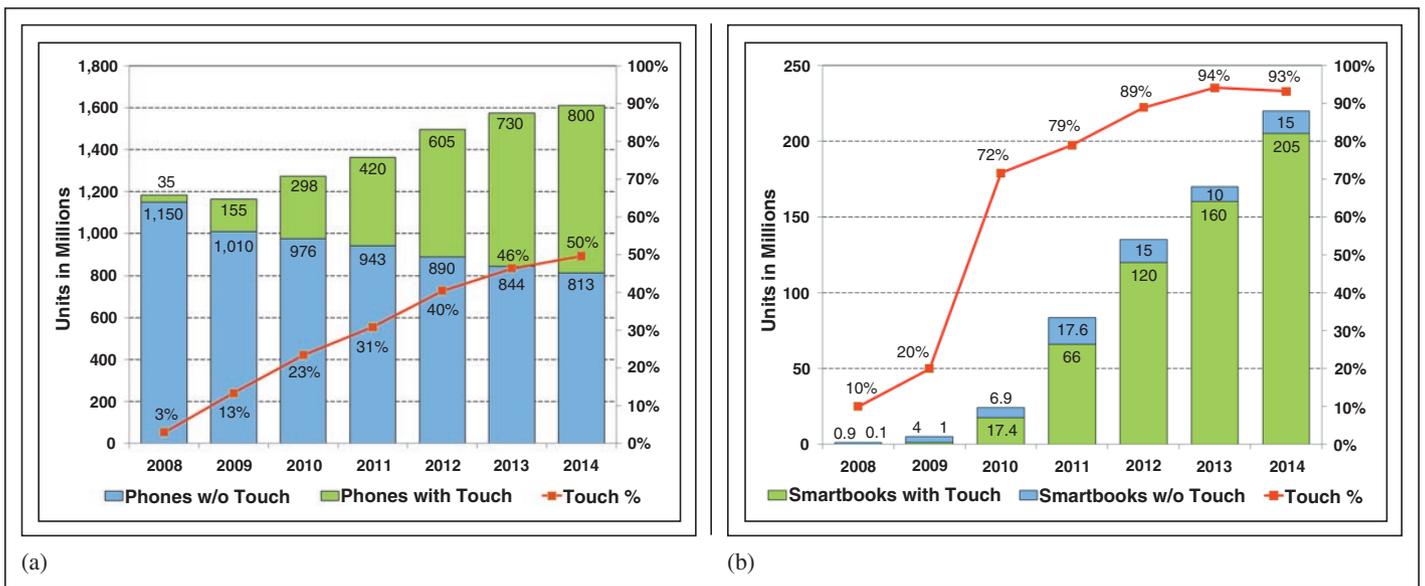


Fig. 2: (a) Mobile-phone and (b) smartbook market sizes are shown in units, with touch penetration shown in both units and the percentage for the period 2008–2014. Source: Displaybank, *op. cit.*

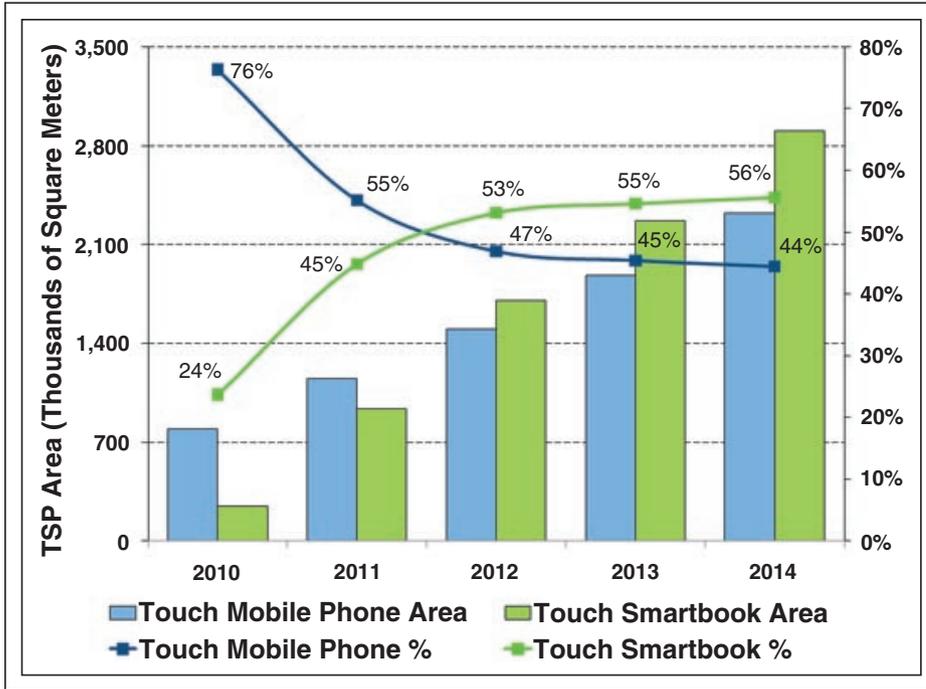


Fig. 3: This comparison of touch-screen-panel areas in thousands of square meters of touch-equipped mobile phones and smartbooks (2010–2014) shows the crossover point where the latter exceeds the former in 2012. Source: Displaybank, op. cit.

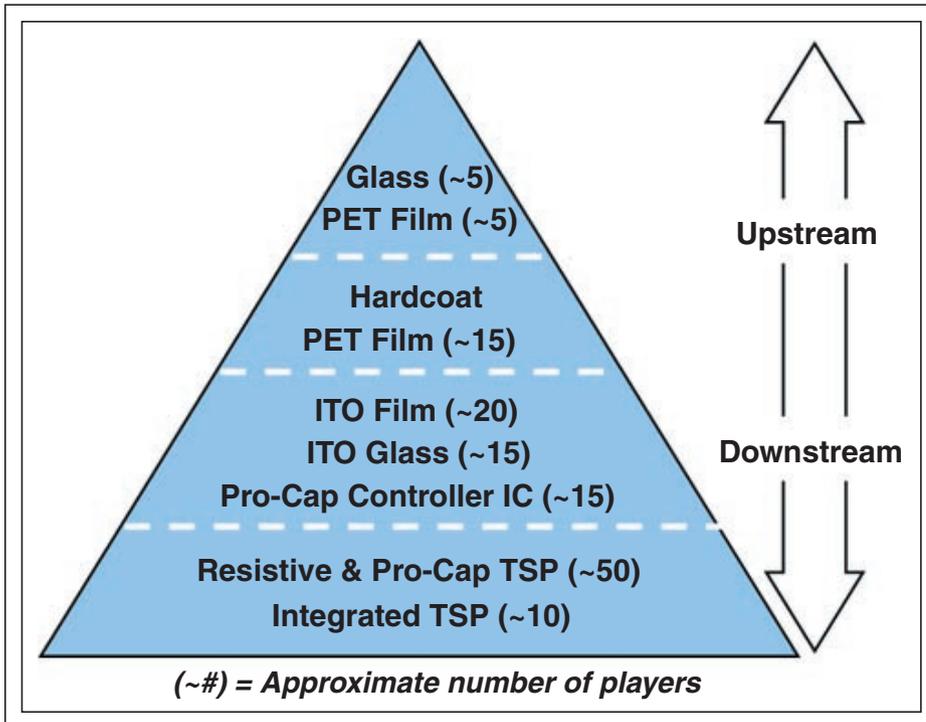


Fig. 4: TSP-industry structure and number of players. Source: Displaybank, op. cit.

Glass-Type vs. Film-Type Pro-Cap

The iPhone in 2007 was the first consumer product to use a pro-cap TSP with indium tin oxide (ITO), a transparent conductor, deposited on glass. The other popular TSP structure that is common in mobile phones is film-type, in which ITO is deposited on one or more film layers that are subsequently laminated to a plastic or glass cover lens. Taiwanese and Korean TSP suppliers are seeing substantial growth in film-type TSP; Displaybank expects film-type TSP to achieve a 54% share in 2011. As the size of a TSP increases, it becomes increasingly difficult to achieve good performance with ITO on film, so Displaybank expects that film-type TSPs will not generally be able to replace glass-type TSPs.

In a comparison between ITO on film and ITO on glass, ITO on film has advantages in safety (it is shatterproof), thinness, lightness, and ease of process. ITO on glass has advantages in cost, optical performance, durability, and narrow bezel. Because the advantages of each type are quite distinct, device OEMs typically select a type by focusing on structural design, usage characteristics, and cost-reduction curves rather than an expectation that one type will survive in the market over the other.

In Taiwan, many companies are building a glass-type TSP infrastructure by transforming existing small- and medium-sized color-filter or STN-LCD production lines. But in the case of Korea, where there are few of either type of production lines, film-type TSPs are dominant in the pro-cap market. Glass-type TSPs have an advantage when a single product is manufactured in high volume, such as in the case of Apple, but film-type TSPs have an advantage for Korean companies, which need to develop a variety of lower-quantity products with quick time-to-market.

Mobile-Device TSP Trends

While there are more than a dozen touch technologies in existence, resistive and projective capacitive are the dominant ones applied in mobile products, which are currently leading the TSP industry. Resistive touch technology works by sensing a contact between two ITO films with a small gap between them, while pro-cap touch technology works by using human-body capacity to change the internal capacitance of the TSP. Because a finger has to touch the surface of a pro-cap TSP, it is desirable to treat the surface with an anti-

fingerprint or anti-corruption coating. The top layer of glass-type TSPs is often made of tempered glass in order to increase durability and provide improved touch sensing. While the usage of tempered glass is increasing, there are a limited number of suppliers, so cost pressure is driving a trend of increased internalization at many TSP suppliers. Pro-cap TSPs have many superior aspects compared with resistive TSPs, not only in their very light touch and multi-touch capability, but also in terms of layer structure, transparency, and durability. For these reasons, pro-cap TSPs are beginning to be more common than resistive TSPs in mobile devices.

In 2009, the market share of resistive TSPs was 72% because pro-cap TSPs were only applied in a few segments of the mobile-phone market. However with the rapidly growing market for smartphones and smartbooks, Displaybank expects the market share of pro-cap TSPs to increase to 51.4% in 2011. Considering only the mobile-phone application, pro-cap's market share has already exceeded that of resistive, with the 2011 share expected to be about 70%. In smartbooks, pro-cap is expected to be used in most cases except in a few models and in e-book readers. The reasons behind the sharp growth of pro-cap are primarily its use in mobile phones (driven by its gesture, multi-touch, and light-

touch capabilities), and its growing use with larger display sizes such as 7, 9, and 10.1 in. Resistive touch technology is expected to continue its presence in game devices that require precise touch, as well as in commercial applications, medical applications, and wherever low cost is the primary requirement.

Current Market Issues

The iPhone/iPad Effect: The iPhone's user interface changed the perception of the value of touch, a value that had been reflected in applications such as printing a boarding pass at an airport check-in kiosk. This gave way to an entirely new way of interacting with devices. In the past, mobile-device touch applications were mostly the province of small- and medium-sized companies such as makers of GPS and game players. Once global powerhouses with superior capital and technological edge such as Samsung, LG, Nokia, and Apple successfully drove touch into mobile-phone applications, interest in the touch industry rose to a new high.

The same effect is happening with the iPad, where the tablet PC market has flipped virtually 180° from its previous state with the coming competition of global makers in the tablet world. Displaybank's 2011 update of the TSP market report includes more discussion of the impact of tablets on the overall touch industry.

Windows 7 Effect: Unlike Windows Vista, Windows 7 has superior basic performance and major upgraded elements such as the support of multi-touch throughout the OS. Because of this, TSPs are generally expected to expand into Windows applications such as monitors and notebooks. Monitors and notebooks with integrated TSPs have relatively higher price ranges than conventional products without touch integration. However, expansion of TSPs into these applications seems very likely, since both major brands and consumers recognize touch technology as one of the key functional aspects of Windows 7.

TSP-Industry Structure Issues

Unlike other industries, the TSP industry is currently booming with many high added-value activities. TSP materials (e.g., PET/glass combinations, hardcoated PET, ITO film, and controller ICs) all have relatively high added-value. An example of added-value in both the resistive and pro-cap TSP industries can be seen in the decorated "touch windows" (cover lenses with printing, silk-screened designs, logos, and other embellishments) sometimes used in mobile devices. As the importance of light touch and multi-touch continues to increase, the expansion of pro-cap capacity progresses. As part of the pro-cap market expansion, controller IC makers

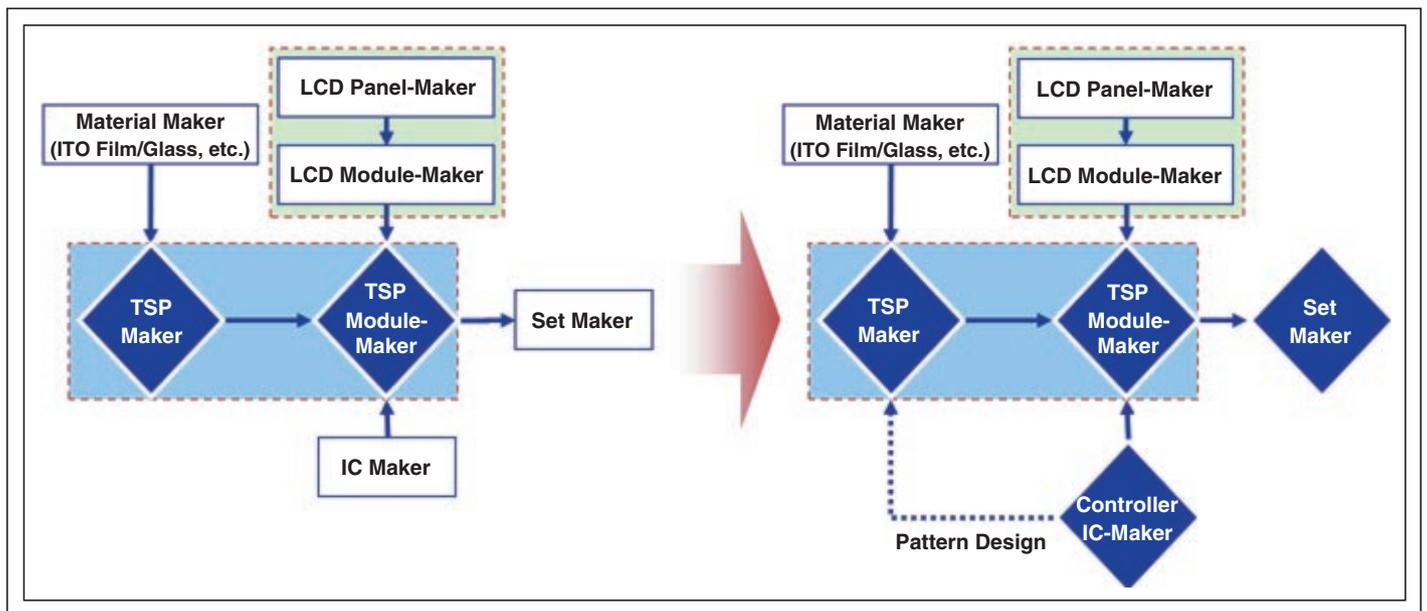


Fig. 5: The hegemony change in the TSP industry is shown from left to right. Diamonds indicate key collaborators, while rectangles indicate other players. Source: Displaybank, op.cit.

display marketplace

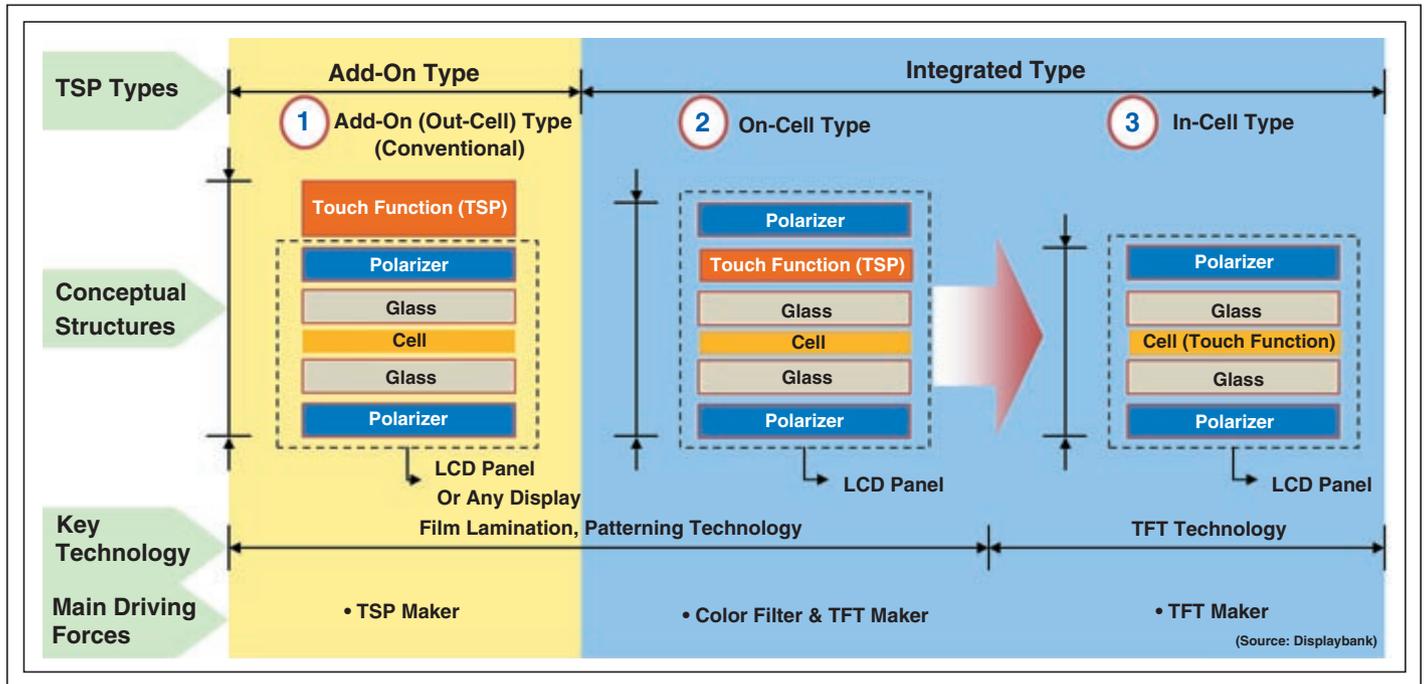


Fig. 6: This comparison shows the conceptual structures, key technology, and main driving forces of conventional TSPs vs. integrated TSPs. Source: Displaybank, op. cit.

with patent barriers show expansion in their significance and control. Encouraged by the introduction and expansion of Windows 7, LCD panel makers intend to aggressively develop and produce integrated TSP technology. Figure 4 shows the TSP industry structure and approximate number of players.

Hegemony Change: Due to the importance of pro-cap, the connections between TSP sensor and module makers, set makers (device OEMs/ODMs), and pro-cap controller-IC makers are having a more significant effect on the supply chain. The industry, once led solely by TSP makers, is now moving to a structure of three collaborators (TSP – Set – Controller). Other TSP material suppliers are also finding the strategic connection with TSP makers and set makers to be important. Figure 5 illustrates this change graphically.

Integrated TSPs: The conventional TSP-industry infrastructure and the integrated TSP infrastructure are different (Fig. 6). The integrated TSP industry is led by LCD panel makers and competes against the conventional TSP industry. The current integrated TSP technology still needs to be verified for mass production, and its effect is not yet significant in light of the TSP industry’s rapid overall growth.

Summary

Because of its ability to add value to mobile phones and smartbooks, touch is expected to continue growing in the future. Currently, the dominant touch technologies are resistive and pro-cap; in the latter, both film-type and glass-type are common and are expected to continue. However, the cost competitiveness, profitability, and customer acceptance of each technology will become increasingly important in markets with intensive competition. Pro-cap is currently winning; Displaybank forecasts that pro-cap’s market share in 2011 will be about 70% in touch mobile phones and about 50% in the overall touch market. ■