Touch Screens and the Mobile Phone Market

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Global Director of Product Management
Tyco Electronics – Elo TouchSystems
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Elo TouchSystems

Business unit of Tyco Electronics
- $13B revenue in 2007
- 92,000 employees in 54 countries (34,000 in China)
- One of the world’s largest electronic component suppliers

Elo TouchSystems
- Founded in 1971; invented the touch screen
- World’s largest revenue for touch-screen products in 2007
- Widest selection of touch technologies
- Nearing a half-billion dollars in revenue with 450 people
- Manufacturing & integration in China, Japan, Brazil, Belgium, New York & California
Agenda

- Touch & mobile phones
- Market drivers & inhibitors
- Mobile phone market size
- Touch penetration
- Technology alternatives
- The holy grail
- The bigger picture

Displaybank: Touch Screen Panel Industry Trends & Business Strategies (11/07)
DisplaySearch: 2008 Touch Panel Market Analysis (5/08)
iSuppli: Touch Screens: Emerging Displays Special Report (5/08)
IMS Research: The Worldwide Market for Touchscreen & Input Technologies for Mobile Handsets (7/08)
Touch & Mobile Phones

Multimedia & data services usage
But ease of navigation & text entry
Until a disruptive change happened…

It’s not just touch.
It’s not just multi-touch.
It’s not even really about touch.
Touch is just an enabler.
Touch Is an Enabler

What did touch enable on the iPhone?

A user interface that provides such incredibly intuitive access to a relatively complex set of functions that even a 7-year-old can use it without training or assistance.
Say What?

Apple *changed the way people think about touch*

- Touch went from something that you poke at in an airport check-in line to an enabler of a whole new way of interacting with devices.

- It’s all about the *user experience*, not the technology!
Drivers & Inhibitors

Market drivers
- Operators’ desire to increase ARPU
- Mobile internet
- Convergence of consumer & enterprise applications
- Asian-language character entry

Market inhibitors
- Higher cost
- Western operators’ need for ROI (subsidy model)
- Technology uncertainty
Forecasted Mobile Phone Market Size (Units)

Billions of Units

- DisplaySearch
- Displaybank
- iSuppli
- IMS Research

Years:
- 2007
- 2008
- 2009
- 2010
- 2011

Forecasted Mobile Phone Market Size (Units)
Forecasted Touch Penetration

- **Displaybank**
- **iSuppli**
- **DisplaySearch**
- **IMS Research**

Mobile Phone Market Penetration

- 0%
- 10%
- 20%
- 30%
- 40%
- 50%
- 60%

Year:
- 2007
- 2008
- 2009
- 2010
- 2011
Many Different Assumptions…

- Smartphone demand & growth rate
- Expansion of touch into the “feature-rich” segment
- Touch becoming a standard feature on mobile phones
- Adoption rate for projected capacitive (the “iPhone effect”)
- Emerging display technologies that defocus touch
- Competing input technologies such as voice
- The emergence of touch-optimized software
- The importance of handwriting recognition in Asia
- The value of haptics in overcoming resistance to touch
- Convergence with other consumer devices
- The degree to which touch will become ubiquitous
Technology Alternatives

Mainstream

- Analog resistive
- Projected capacitive

Emerging

- Acoustic Pulse Recognition [APR] (Elo TouchSystems)
- Waveguide infrared (RPO)
- Traditional infrared (Neonode)
- Digital resistive (Wintek, others)
- LCD in-cell (AUO, Sharp, others)
## Mainstream Technologies Compared

<table>
<thead>
<tr>
<th>Feature</th>
<th>Analog Resistive</th>
<th>Projected Capacitive</th>
</tr>
</thead>
<tbody>
<tr>
<td>Touch Object</td>
<td>Stylus &amp; finger</td>
<td>Finger-only</td>
</tr>
<tr>
<td>Multi-Touch</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Durability</td>
<td>Poor (plastic)</td>
<td>Excellent (glass)</td>
</tr>
<tr>
<td>Clarity</td>
<td>Fair</td>
<td>Very good</td>
</tr>
<tr>
<td>Flush Surface</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Power Consumption</td>
<td>Very low</td>
<td>Moderate</td>
</tr>
<tr>
<td>Stable Calibration</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Cost</td>
<td>Very low</td>
<td>High</td>
</tr>
</tbody>
</table>
Forecasted Mainstream Technology Share in 2011

- **Projected Capacitive**
- **Resistive**

<table>
<thead>
<tr>
<th>Technology</th>
<th>IMS Research</th>
<th>iSuppli</th>
<th>DisplaySearch</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>80%</td>
<td>70%</td>
<td>60%</td>
</tr>
<tr>
<td></td>
<td>40%</td>
<td>30%</td>
<td>20%</td>
</tr>
<tr>
<td></td>
<td>10%</td>
<td>10%</td>
<td>10%</td>
</tr>
<tr>
<td></td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
</tr>
</tbody>
</table>

**Source:**

- IMS Research
- iSuppli
- DisplaySearch
The Holy Grail

The ideal touch technology for a mobile phone

1. Stylus & finger usage
2. Multi-touch
3. High durability
4. High transparency & clarity
5. Completely flush top surface
6. Low power consumption
7. Stable calibration
8. Narrow borders
9. Substrate independence
10. Low cost
## There Is No Perfect Touch Technology

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Analog Resistive</th>
<th>Projected Capacitive</th>
<th>APR</th>
<th>Waveguide Infrared</th>
<th>Traditional Infrared</th>
<th>Digital Resistive</th>
<th>LCD In-Cell</th>
</tr>
</thead>
</table>

### Evaluation Criteria:
- **Best**
- **OK**
- **Worst**
Why Just Mobile Phones?

iSuppli’s forecast for <10-inch touch screens in 2011
(assumes 27.5% touch penetration in mobile phones)

<table>
<thead>
<tr>
<th>Touch Screen Application</th>
<th>&lt;3-inch</th>
<th>3.x-4.x-inch</th>
<th>5.x-9.x-inch</th>
<th>Total</th>
<th>Share</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mobile Phone (000 units)</td>
<td>324,435</td>
<td>100,731</td>
<td></td>
<td>425,167</td>
<td>68.1%</td>
</tr>
<tr>
<td>Gaming/Entertainment</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Navigation System</td>
<td>59,825</td>
<td>7,484</td>
<td></td>
<td>67,309</td>
<td>10.8%</td>
</tr>
<tr>
<td>MP3/PMP</td>
<td>3,385</td>
<td>24,758</td>
<td></td>
<td>28,143</td>
<td>4.5%</td>
</tr>
<tr>
<td>Small-Screen PC</td>
<td></td>
<td></td>
<td></td>
<td>14,246</td>
<td>2.3%</td>
</tr>
<tr>
<td>Others</td>
<td>7,420</td>
<td>3,728</td>
<td></td>
<td>14,076</td>
<td>2.3%</td>
</tr>
<tr>
<td>PDA</td>
<td></td>
<td></td>
<td></td>
<td>4,690</td>
<td>0.8%</td>
</tr>
<tr>
<td>Retail</td>
<td>953</td>
<td>1,396</td>
<td></td>
<td>2,349</td>
<td>0.4%</td>
</tr>
<tr>
<td>Office Printer</td>
<td>667</td>
<td>110</td>
<td></td>
<td>2,012</td>
<td>0.3%</td>
</tr>
<tr>
<td>Medical</td>
<td></td>
<td></td>
<td></td>
<td>302</td>
<td>0.0%</td>
</tr>
<tr>
<td>Industrial/Financial</td>
<td>32</td>
<td>65</td>
<td></td>
<td>97</td>
<td>0.0%</td>
</tr>
<tr>
<td>Grand Total</td>
<td>335,240</td>
<td>263,025</td>
<td>26,053</td>
<td>624,318</td>
<td>100.0%</td>
</tr>
<tr>
<td>ASP ($)</td>
<td>2.7</td>
<td>6.3</td>
<td></td>
<td>21.2</td>
<td></td>
</tr>
<tr>
<td>Mobile Phone TAM (000 $)</td>
<td>$875,975</td>
<td>$634,608</td>
<td>$0</td>
<td>$1,510,583</td>
<td></td>
</tr>
<tr>
<td>Non-Mobile Phone TAM (000 $)</td>
<td>$29,174</td>
<td>$1,022,447</td>
<td>$552,327</td>
<td>$1,603,948</td>
<td></td>
</tr>
</tbody>
</table>
Mobile Phones Aren’t Easy

The mobile phone touch-screen business

- Extremely high volumes
- Very small number of customers (OEMs)
- Limited opportunity for new technologies
- Rapid product introduction cycles
- Difficult to differentiate products
- Many new competitors
- Very low average selling prices
- Intense pressure on margins
The Bigger Picture

- Appliance
- ATM
- Automotive entertainment
- Automotive in-dash system
- Bedside entertainment
- Blood glucose meter
- Casino gaming machine
- Copier
- Desktop touch monitor
- Digital still camera
- Digital video camera
- e-Book/dictionary
- Electronic cash register
- Entertainment device
- Gas pump
- Handheld industrial device
- Home automation controller
- Home healthcare device
- In-flight entertainment
- Industrial controller
- Insulin delivery controller
- Interactive digital signage
- Internet access terminal
- IP phone
- Jukebox
- Lottery terminal
- Machine control panel
- Media player
- Medical monitor
- Mobile internet device
- Mobile phone
- Notebook
- Patient monitor
- PDA
- Photo kiosk
- Point of information kiosk
- Point of sales terminal
- Portable game
- Portable GPS
- Portable industrial device
- Price-checker
- Printer
- Projector
- Self-service terminal
- Shopping cart tablet
- Signature capture device
- Solar power controller
- Tablet computer
- Ticketing machine
- Touchcomputer
- UMPC (Ultra-Mobile PC)
- Voting machine
- Wind power controller
- X-ray machine
Touch Is Exploding!

It’s everywhere!
Thank You!

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