

Touch Screens and the Mobile Phone Market

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Business unit of Tyco Electronics

- ❖ \$14B 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: *Small-Medium Touch Screen Panel Industry Trends (7/08)*

DisplaySearch: *2008 Touch Panel Market Analysis (5/08)*

IMS Research: *The Worldwide Market for Touchscreen & Input Technologies for Mobile Handsets (7/08)*

iSuppli: *Touch Screens: Emerging Displays Special Report (5/08)*

Touch & Mobile Phones

Multimedia & data services usage 

But ease of navigation & text entry 

Until a disruptive change happened...



The
Apple
iPhone

It's not just touch.
It's not just multi-touch.
It's not even really about touch.
Touch is just 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!

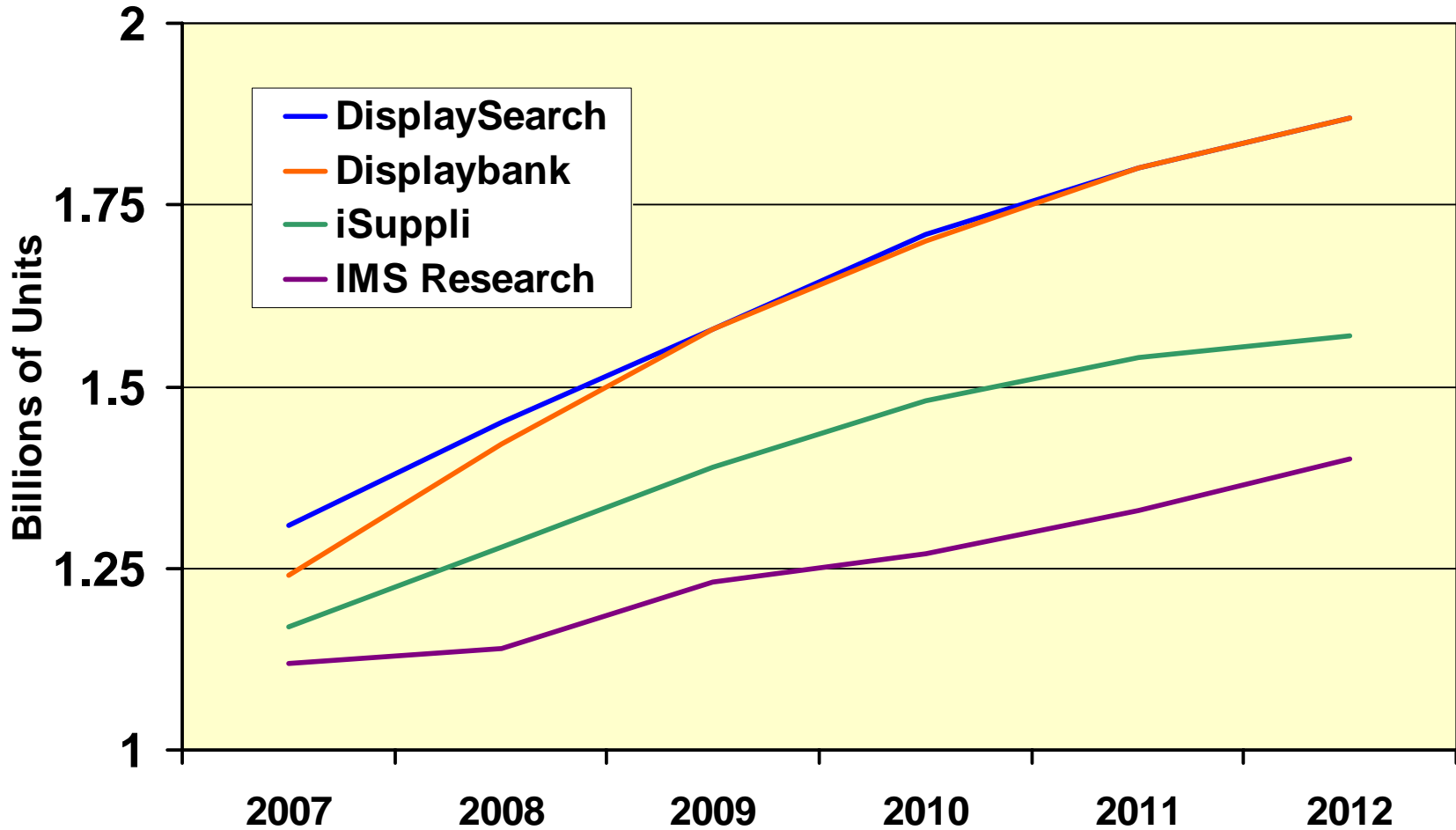
Market drivers

- ❖ Operators' desire to increase ARPU
- ❖ Mobile internet
- ❖ Asian-language character entry
- ❖ Convergence of consumer & enterprise applications

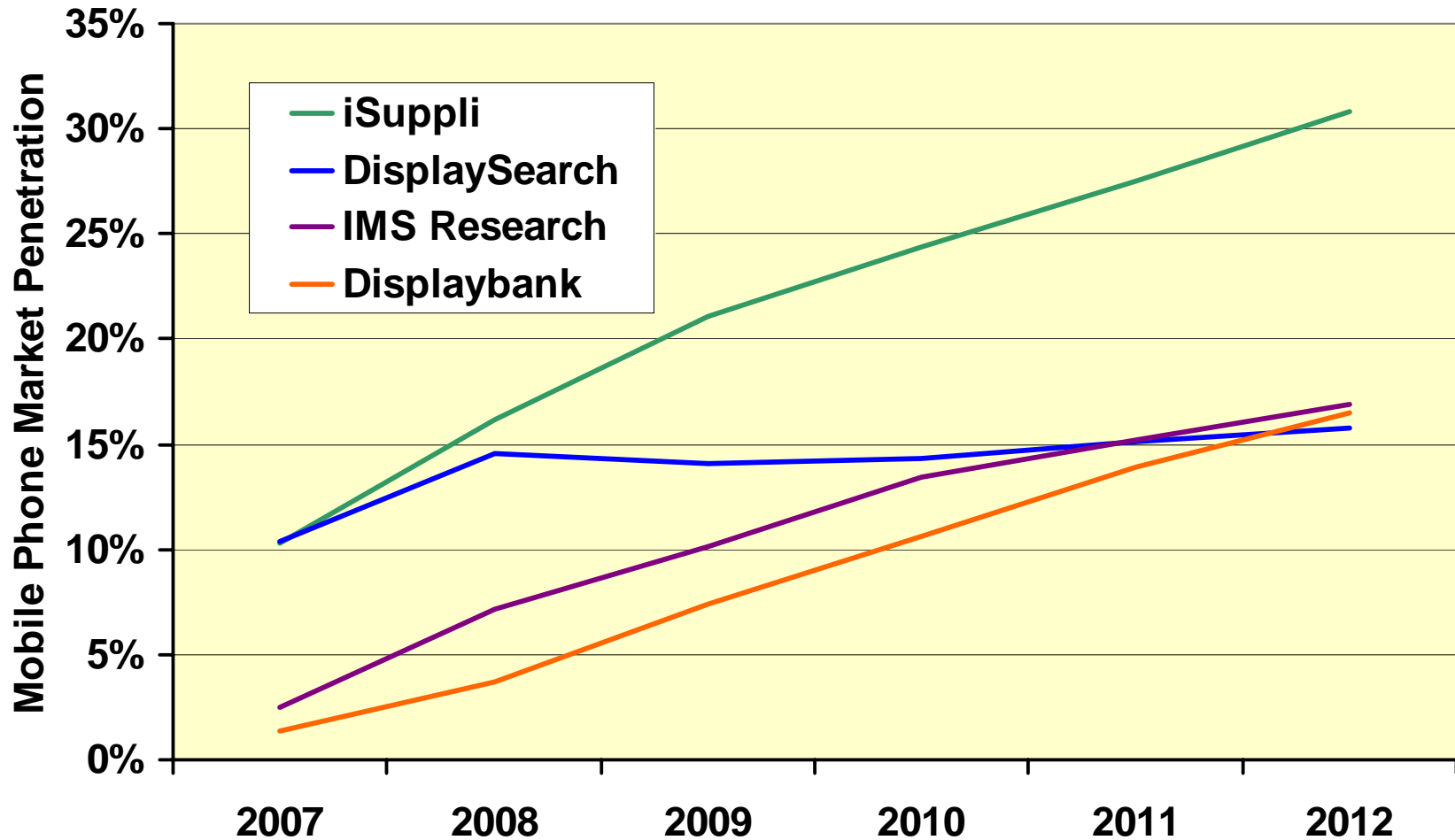
Market inhibitors

- ❖ Higher cost
- ❖ Western operators' need for ROI (subsidy model)
- ❖ Technology uncertainty

Forecasted Mobile Phone Market Size (Units)



Forecasted Touch Penetration



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”)
- ❖ The emergence of touch-optimized software
- ❖ The importance of handwriting recognition in Asia
- ❖ Emerging display technologies that defocus touch
- ❖ Competing input technologies such as voice
- ❖ The value of haptics in overcoming resistance to touch
- ❖ Convergence with other consumer devices
- ❖ The degree to which touch becomes ubiquitous

Technology Alternatives

Mainstream

- ❖ Analog resistive
- ❖ Projected capacitive



Emerging

- ❖ Acoustic Pulse Recognition [APR] (Elo TouchSystems)
- ❖ Traditional infrared (Neonode)
- ❖ Waveguide infrared (RPO)
- ❖ Digital resistive (Stantum, others)
- ❖ LCD in-cell (AUO, Sharp, others)

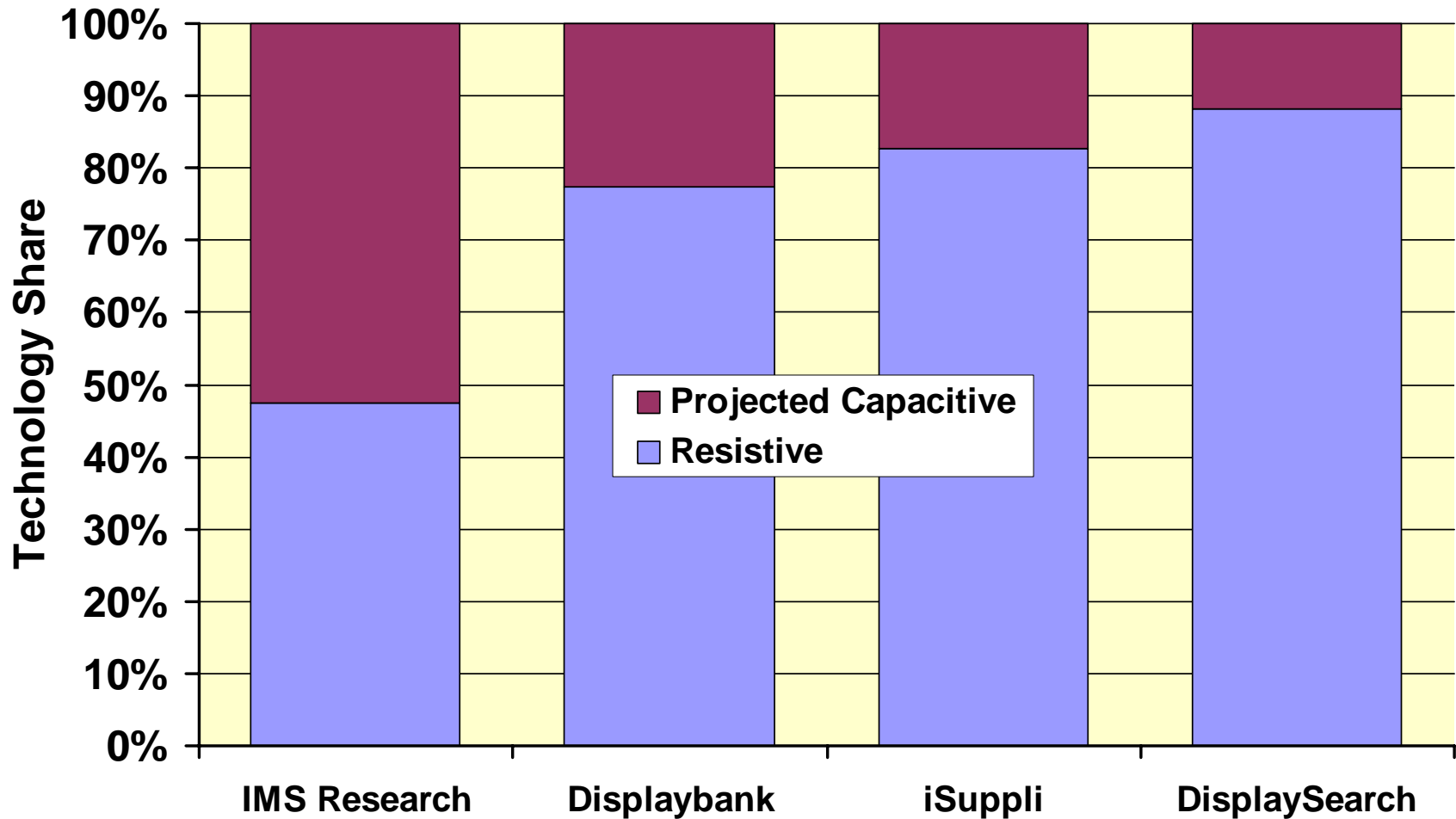


Mainstream Technologies Compared



| | Analog Resistive | Projected Capacitive |
|--------------------|-------------------------|-----------------------------|
| Touch Object | Stylus & finger | Finger-only |
| Multi-Touch | No | Yes |
| Durability | Poor (plastic) | Excellent (glass) |
| Clarity | Fair | Very good |
| Flush Surface | No | Yes |
| Power Consumption | Very low | Moderate |
| Stable Calibration | No | Yes |
| Cost | Very low | High |

Forecasted Mainstream Technology Share in 2012



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



| |  Analog Resistive |  Projected Capacitive |  APR | Waveguide Infrared | Traditional Infrared | Digital Resistive | LCD In-Cell |
|---------------------------------|--|--|---|--------------------|----------------------|-------------------|-------------|
| 1 Stylus Independence | | | | | | | |
| 2 Multi-Touch | | | | | | | |
| 3 Durability | | | | | | | |
| 4 Optical Performance | | | | | | | |
| 5 Flush Surface | | | | | | | |
| 6 Power Consumption | | | | | | | |
| 7 Stable Calibration | | | | | | | |
| 8 Narrow Borders | | | | | | | |
| 9 Substrate Independence | | | | | | | |
| 10 Cost | | | | | | | |

| | |
|--|-------|
| | Best |
| | OK |
| | Worst |

Why Just Mobile Phones?



iSuppli's forecast for <10-inch touch screens in 2012
(assumes **30.8%** touch penetration in mobile phones)

| Touch Screen Application | <3-inch | 3.x-4.x-inch | 5.x-9.x-inch | Total | Share |
|--------------------------------------|------------------|--------------------|------------------|--------------------|---------------|
| Mobile Phone (000 units) | 365,530 | 117,036 | | 482,566 | 67.9% |
| Gaming/Entertainment | | 76,539 | | 76,539 | 10.8% |
| Navigation System | | 63,222 | 8,126 | 71,348 | 10.0% |
| MP3/PMP | 3,554 | 27,556 | | 31,110 | 4.4% |
| Small-Screen PC | | | 23,280 | 23,280 | 3.3% |
| Others | 8,550 | 4,298 | 3,618 | 16,466 | 2.3% |
| PDA | | 4,380 | | 4,380 | 0.6% |
| Retail | | 1,077 | 1,717 | 2,794 | 0.4% |
| Office Printer | 681 | 121 | 1,359 | 2,161 | 0.3% |
| Medical | | | 423 | 423 | 0.1% |
| Industrial/Financial | | 34 | 70 | 104 | 0.0% |
| Grand Total | 378,315 | 294,263 | 38,593 | 711,171 | 100.0% |
| ASP (\$) | 2.5 | 5.8 | 19.4 | | |
| Mobile Phone TAM (000 \$) | \$913,825 | \$678,809 | \$0 | \$1,592,634 | |
| Non-Mobile Phone TAM (000 \$) | \$31,963 | \$1,027,917 | \$748,704 | \$1,808,583 | |

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!



Thank You!

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