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Steve Jobs reportedly called Android a “stolen product.” If he was right, then

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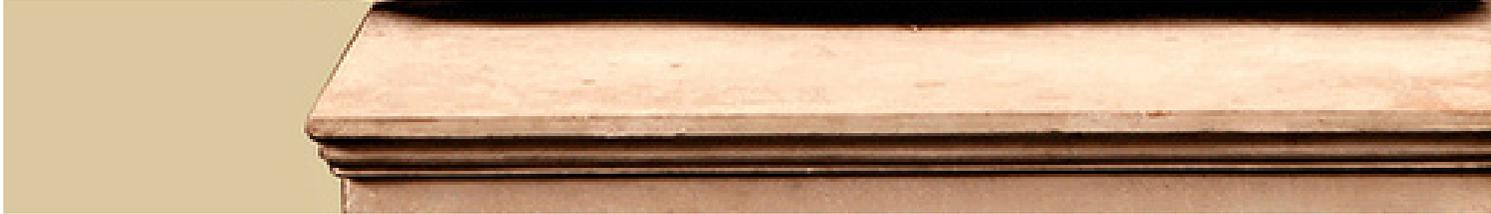
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TIMOTHY B. LEE - 2/23/2012, 9:00 AM



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Urban street artist Banksy and Apple CEO Steve Jobs, kindred souls?

According to his official biographer, Steve Jobs went ballistic in January 2010 when he saw HTC's newest Android phone. "I want you to stop using our ideas in Android," Jobs reportedly told Eric Schmidt, then Google's CEO. Schmidt had a [resign from Apple's board](#), partly due to increased smartphone competition between the two companies. Jobs said, "I will not spend every penny of Apple's \$40 billion in the bank to right this wrong."

Jobs called Android a "stolen product," but theft can be a tricky concept when talking about innovation. The iPhone was fully formed from Jobs's head. Rather, it represented the culmination of incremental innovation over decades that occurred outside of Cupertino.

Innovation within multitouch and smartphone technology goes back decades—the first multitouch devices were developed in the 1980s—and spans a large number of researchers and commercial firms. It wouldn't have been possible to create the iPhone without copying the ideas of these other researchers. And since the release of Android, Apple has incorporated many of these ideas into iOS.

You can call this process plenty of names, some less than complimentary, but consumers generally benefit from the copying within the smartphone market. The best ideas are quickly incorporated into all the leading mobile platforms.

The [current legal battles over smartphones](#) are a sequel to the "look and feel" battle over the graphical user interface (GUI) in the late 1980s. Apple lost that first fight when the courts ruled key elements of the Macintosh user interface were not eligible for copyright protection. Unfortunately, in the last 20 years, the courts have made it much easier to acquire software patents. Apple now has more powerful legal weapons at its disposal this time around, as do its competitors. Together, there's a real danger that the smartphone wars will end by stifling competition.

Pierre Wellner



The "Digital Desk" in 1999 showing the resize gesture in 1999

Multitouch in the lab

High-tech innovations are often developed by laboratory researchers long before they're introduced into the marketplace. Multitouch computing was no exception. According to Bill Buxton, a multitouch pioneer now at Microsoft Research, the first multitouch screen was developed at Bell Labs in 1984. Buxton reports that the screen, created by Bob Boie, consisted of a "capacitive array of touch sensors overlaid on a CRT." It allowed the user to "manipulate graphical objects with a very low response time."

In the two decades that followed, researchers experimented with a variety of techniques for building multitouch interfaces. The Xerox PARC project called the "Digital Desk" used a projector and camera situated above an ordinary desk to create a multitouch table called the DiamondTouch also used an overhead projector, but its touch sensor ran a small sensor through the user's body into a receiver in the user's chair. NYU researcher Jeff Han developed a rear-projected multitouch table that achieved multitouch capabilities through a technique called "frustrated total internal reflection."

While they refined multitouch hardware, these researchers were also improving the software that ran on it. One of the most important areas of research was developing a vocabulary of gestures that took full advantage of the the hardware's capabilities. The "Digital Desk" project included a sketching application that **allowed images to be re-sized** with a "pinch" gesture. A 2003 article by researchers at the University of Toronto **described** a tabletop touchscreen system that included a "flick" gesture to send objects from one user to another across the table.

By February 2006, Han brought a number of these ideas together to create a suite of multitouch applications that he presented in a now-famous **TED talk**. He showed off a photo-viewing application that used the "pinch" gesture to re-size and rotate photographs; it included an on-screen keyboard for labeling photos. He also demonstrated an interactive map that allowed the user to pan, rotate, and zoom with dragging and pinching those used on modern smartphones.



TED

Jeff Han demonstrates his multitouch applications at a TED talk in 2006.

Commercializing multitouch

In 2004, a French firm called Jazzmutant **unveiled the Lemur**, a music controller many consider the world's first multitouch product. The Lemur could be configured to display a wide variety of buttons, sliders, and other UI elements. When these were manipulated, the device would produce output in the MIDI-like Open Sound Control format and cost more than \$2,000.

The market for the Lemur was eventually undercut by the proliferation of low-cost tablet computers like the iPad. Jazzmutant now licenses its multitouch technology under the name **Stantum**. It **raised \$13 million** in funding in 2009.

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