Smarter Phones, Smarter Moves

The $200 billion mobile phone industry has reached a watershed moment. The rise of the smartphone—iPhone, Droid, Galaxy—has pushed some handset makers to find new ways to build sustainable margins.
The rise of the smartphone—a highly sophisticated and complex device—has forced some mobile phone makers to abandon the vertically integrated business model that has long dominated the handset industry. The shift stems from the increasing reliance on operating systems (OS) and chipsets developed by third parties—for example, the Android OS in a Motorola phone. This reliance could give software and semiconductor companies the power to dictate mobile phone development in the same way that the so-called Wintel platform forged by Microsoft and Intel has shaped the personal computer (PC) sector. If that happens, the danger for device makers is that they will end up competing solely on price and profit margins, and the mobile phone industry will fall inexorably toward the razor-thin levels that prevail among PC manufacturers.

However, several major differences exist between the PC sector and the mobile phone sector, which suggest that the two industries may follow quite different paths. The mobile phone is a much more personal device than a PC, which means that hardware design and access to leading-edge components such as high-resolution screens, flash storage, cameras, and sensors are more important factors. The mobile phone is also used in many different scenarios. Moreover, a handset has a small screen with limited real estate, making the role of the user interface more important than on a PC. Furthermore, operators play a major role in the distribution of mobile phones, often subsidizing retail prices.

The cloud could play a decisive role. **Apple clearly has a lead with iCloud,** but also gearing up are Amazon, Google, and Microsoft with Nokia.

Two additional important factors will come into play. In the future, the smartphone is likely to become the anchor device for the entire digital, communications, and media value chain. Many consumers will want to use their smartphones to control other devices and manage content, apps, and services, so handsets will need to be fully interoperable with a wide range of consumer electronics and home appliances.

Second, the rise of the HTML5 set of Web standards will enable sophisticated smartphone applications to run in a web browser, potentially reducing the importance of the OS. In time, handset makers may be able to use HTML5 to create a compelling smartphone experience, regardless of the underlying operating system.

**Apps and Hardware: A Tug of War**

The mobile industry faces four possible scenarios (see figure 1 on page 3). Which one actually plays out will depend on which handsets customers value. Do customers look for a compelling user interface and seamless integration with Internet services and other devices, such as televisions, game consoles, and tablet computers? Or, do they want an open environment that

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1 HTML5 is the collective name for a set of emerging Web standards. It refers to the fifth revision of the hypertext markup language and file extension.
allows them to choose the most compelling solution available in the market for each component—for example, user interface, user experience, OS, hardware and service platform?

As of today, the PC World scenario shown in figure 1 is quite unlikely. Although the growing complexity of smartphones is encouraging different players to specialize in different parts of the value chain, it can be difficult to meld software, hardware, services, and content designed by different companies into one coherent and attractive package. There is still room for more innovation on the hardware side.

The success of the iPhone is due in part to Apple’s vertically integrated business model—from hardware (the iPhone) to operating system (iOS) to app store (App Store). This model is well suited to developing an elegant combination of hardware, software, and services that can produce a compelling and intuitive experience on a handheld device with a much smaller screen than a PC. The original iPhone’s groundbreaking touch-screen experience came about because Apple had total control over both the hardware and software.

The enormous popularity of the iPhone has shifted the balance of power in commercial relationships between handset makers and operators. While contract details are kept secret, operators routinely spend more than $400 to subsidize iPhones, and other smartphones such as leading

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**Figure 1**

**Four possible scenarios for the mobile industry**

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<th>Level of horizontal or vertical integration</th>
<th>Integration (closed ecosystems)</th>
<th>Disintegration (open standards)</th>
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<tr>
<td><strong>PC world</strong></td>
<td>• Existing integrated ecosystems collapse/open (Apple)</td>
<td>• Device innovation including form factor, display, and sensors attract customers and drive more innovative apps (with new APIs)</td>
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<td>• User interface and apps dominated by a few OS players and key buying criteria for device (Android, Windows, iOS)</td>
<td>• User interface is key differentiator, but customers will switch</td>
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<td>• Price pressure on handsets rises as vendors “equalize” on features</td>
<td>• Most apps are OS-independent</td>
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**App-user interface battle**

- Integrated closed ecosystems continue to lead and grow (Apple)
- Application environment is key buying criteria with lock-in (app store)
- Innovative device technology not valued unless breakthrough

**Device battle**

- Innovative device hardware is key buying criteria, but must fit in ecosystem
- Customer willingness to switch between application environments (limited lock-in)
- Innovative device hardware is key buying criteria, but must fit in ecosystem
- Customer willingness to switch between application environments (limited lock-in)
- Device attractiveness drives full ecosystem competition

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Note: API is application programming interface.
Source: A.T. Kearney analysis
Samsung models are also heavily subsidized to boost customer adoption. In the United States, for example, AT&T, Sprint, and Verizon Wireless all offer contract customers the entry-level iPhone 4S for $199.99, compared to $649.99 for an unlocked model. Sprint has a four-year contract with Apple to buy a set number of iPhones at a cost of about $15.5 billion. While Sprint hasn’t said how many iPhones it must purchase, its cost for each added iPhone subscriber would be 40 percent higher than the average non-iPhone customer.

Apple’s success may have influenced Google’s strategy. Although the Internet services giant offers the Android OS to all comers, Google became determined to develop reference hardware designs. At the same time, Google co-developed the Nexus-branded series of smartphones in partnership with HTC and Samsung. Google’s pending acquisition of Motorola Mobility is being driven largely by the need to acquire wireless intellectual property. Google will likely ensure that Motorola’s hardware evolves in tandem with Android. Rival device manufacturers such as Samsung and HTC will probably respond by both customizing Android heavily in order to create a different user experience and reinforcing their multi-operating system strategies.

After abandoning the Symbian OS early on, Samsung succeeded in developing leading-edge handsets using multiple operating systems. At the same time, Samsung developed its own operating system—called Bada—to push smartphones into the mid-market and cannibalize the feature-phone segment. With its broad portfolio and high innovation rate, Samsung has gained global market leadership in the smartphone segment.

The smartphones of the future may be capable of producing holographic images that appear to float above the device...

Nokia is mounting a strong challenge to the Android and Apple ecosystems by rolling out several distinctive new smartphones running Microsoft’s Windows Phone operating system. Windows has struggled to gain traction in the smartphone market, and now the alliance between Microsoft and Nokia gives this platform a major boost. Nokia’s new Windows models have won some very positive reviews, and these models may also gain support from mobile operators keen to encourage competition and innovation in the handset sector.

Time for Differentiation

In practice, handset makers can still differentiate in several major areas, even if they use Android or Windows operating systems running on application processors based on the industry-standard reference architecture developed by ARM. These areas include physical design, user interface, the degree of interoperability with other devices, display technology, and the sensors embedded in the hardware. The scope for differentiation is greater than in the PC market, so leading handset makers could earn respectable profit margins.
Most mobile phone makers lack the resources necessary to mimic Apple and develop a full package of software, services, and hardware. Nevertheless, Samsung, HTC, Nokia, Sony, and other manufacturers continue to produce distinctive handsets. They use application processors and operating systems designed by third parties such as Qualcomm, Nvidia, Google, and Microsoft, and then innovate on top of these underlying platforms. Thus the user interface and the related user experience are becoming key battlegrounds for handset makers (see figure 2).

Android has a range of customization options. At one end of the spectrum is simply selecting specific apps to appear on the home screen when the device ships. At the other end is the possibility of creating a user-interface layer to deliver a unique look and feel. Among those that have overlaid Android with a distinctive user interface are Samsung, HTC, Motorola, and Sony. Mobile operators such as China Mobile have followed suit, integrating their own communications and content services into the operating system. While operating system players try to control the user interface (both technically and contractually), handset makers strive to protect one of their few sources of differentiation.²

Many handset makers have considered developing their own operating systems to regain control, but it’s not easy for a new operating system to gain critical mass and support from application developers. An operating system is often judged on how many applications are

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² Conceptually, a pure operating system and a graphical user interface are separate from one another. Notable examples from the past are MS-DOS and Windows and Unix and X Window System (X11). However, over the years—initially driven by Apple—operating systems incorporated the graphical user interface and the two became synonymous.
available and how many developers support the platform. However, HTML5 and other new technologies could change that picture by giving app developers greater freedom.\(^3\)

HTML5 will also allow handset makers to customize the user experience, regardless of the underlying OS. In addition, the user interface will be changed by developments such as gesture control, letter recognition, motion recognition, and voice recognition as promoted by Apple’s virtual assistant, Siri. On the whole, the operating system will be less important, while the user interface continues to be a key differentiator.

**At the Heart of the Ecosystem**

In the future, consumers will rely increasingly on smartphones to interact with their surroundings (see figure 3). This means software and hardware must be designed to interact with legacy and third-party equipment, allowing smartphones to control televisions, make point-of-sale payments, and exchange data with enterprise IT systems, among other things.

To satisfy consumer demand for a seamless “infotainment” experience, more smartphones will be designed to share and synchronize content across consumer electronics from many manufacturers. Synchronization will be enabled both by sophisticated cloud-based services and by localized solutions, such as near field communication (NFC), a contactless technology for exchanging data between two devices in the same vicinity, and high-definition multimedia interface (HDMI), a high-speed cable-based interface for transmitting digital data. Devices that are easy to use with other devices will prove popular with consumers.

The ongoing battle for control of the evolving multiple-screen environment extends far beyond smartphones into the whole ecosystem of consumer electronics—tablets, smart televisions and set-top boxes, PCs and laptops, and smart TVs.

**Figure 3**

*The smartphone’s role in the ecosystem: identity, connectivity, and control*

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*For more information on HTML5 and apps, see “The App Frenzy—Just a Short-Lived Fad?” at www.atkearney.com.*
with set-top boxes, PCs and laptops, game consoles, and even other connected devices such as vehicles and home appliances. Some consumer electronics players such as Samsung cover all device categories and make them interoperable. Apple, on the other hand, is trying to conquer one category after the other. Software-oriented players such as Microsoft and Google try to overlay the devices with their user interface and service platforms.

Cloud-based service platforms could play a decisive role in this battle. In the consumer space, Apple clearly has a lead with iCloud, but also gearing up are Amazon, Google, and Microsoft, which has joined forces with Nokia. Preparing to join the battle are several smart-device players such as Samsung, LG, and Sony. It remains to be seen whether this integration with service platforms will be only for apps, or whether devices remain important in a vertically integrated setup. History has shown that vertically integrated plays lead for only a limited time and eventually are overtaken by the power of distributed innovation.

In business, a smartphone is ideal for connecting employees to the enterprise ecosystem and for mobilizing a company’s complete IT environment. Many of these integration efforts are covered by system integrators and app developers, rather than by handset makers. However, among the areas where handset makers play a vital role in the business sector are device management, access control, security, data protection, and cost control—as the long-lasting success of RIM/Blackberry demonstrated.

...vertically integrated plays lead for only a limited time and eventually are **overtaken by the power of distributed innovation**.

Beyond this lies a wide scope for innovation and differentiation by developing specialized devices. Companies might buy specialized handsets with hardware and a user interface optimized for remote control and data management. These would be useful in settings as diverse as facilities, factories, hospitals, airports, logistics, and retail. Portable smartphones with connected computing power clearly present opportunities for handset makers. But these specialized devices will ship in smaller quantities than mainstream consumer models.

**The Hardware Arms Race**

As ever more content, services, and apps are pushed into the cloud, the smartphone is not being dumbed down. Skyrocketing traffic is causing increased congestion on city-based wireless networks, and many consumers are looking for smartphones that can perform both offline and online. This means that within the constraints imposed by battery life, smartphones will continue to pack a growing armory of computing power.

Like PC makers, handset manufacturers will try to differentiate by using faster multi-core processors, better graphics chips, and more memory. Manufacturers will continue experimenting with different form factors, differentiated by degrees of thinness and weight. But manufacturers can make their hardware stand out in many other ways. For example, they can add high-resolution displays, multiple or better cameras, new kinds of sensors and radios, more powerful batteries, and sophisticated audio technologies.
Display technology in particular is developing rapidly. Organic light-emitting diode (OLED) displays, which are brighter and have a greater contrast than conventional liquid crystal displays (LCDs), are becoming common in high-end phones. Samsung is using large super active-matrix organic light-emitting diode (Super AMOLED) displays, combined with an exceedingly slim form, to differentiate its smartphones. At the top end, the 400-plus pixels per inch (PPI) screen resolution has already exceeded the level of differences of 300 PPI recognized by the human eye. Other innovations in the pipeline include flexible displays that can be rolled up, and volumetric displays that use multiple planes to create three-dimensional images. The smartphones of the future may also be capable of producing holographic images that appear to float above the device or of projecting images onto a much larger screen.

Smartphone buyers are far more likely than PC buyers to celebrate diversity. After all, the handset you carry says something about you.

Additionally, smartphones are being equipped with a growing array of sensors that open up new forms of interaction and enable new services. Proximity sensors, for example, can disable the touch screen when the handset is near the ear, while motion sensors can allow consumers to interact with a device by using gestures. Sensors can be used to identify fingerprints and authenticate the owner of the handset or to monitor vital signs such as heart rate and breathing. In the future, consumers who are environmentally conscious will likely be able to buy mobile phones that can measure air quality, temperature, and noise pollution. Embedded NFC chips will enable smartphones to quickly retrieve information and complete purchases and other transactions at the point of sale.

As smartphones become more powerful and usage rises, battery performance will become increasingly important. Battery development has not kept pace with device technology development, so optimizing power usage will continue to be a key design factor for hardware innovations and software development. A major innovation that extends battery life could well be a game changer.

Who Buys What and Why

Operating systems will surely play an important role in smartphone development. Until HTML5 matures, the capabilities and flexibility of the operating system will largely determine the device makers’ scope for innovation. Moreover, the battle for dominance of the smartphone OS will no doubt continue with Google, Apple, and Microsoft all trying to strengthen their broader strategic positions in the telecom, IT, media, and entertainment ecosystems.

But for many people, a smartphone’s operating system may not be the key purchasing criteria. The fashion conscious may choose a handset partly on appearance, while elderly users might

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4 OLED displays don’t require a backlight, so they can be thinner and lighter than LCDs. In conditions of low ambient light, an OLED screen can achieve a higher contrast ratio than an LCD.
seek phones with user interfaces adapted for those with poor eyesight or limited dexterity. Engineers and avid gamers may choose phones with user interfaces optimized for specific applications.

While the best games and other demanding apps will continue to tap the native abilities of the device, HTML5 apps will deliver a good experience for many Internet services. As HTML5 becomes established, many applications will be readily available across all smartphone platforms, giving device manufacturers more flexibility about which operating system they deploy in a specific handset. Many consumers will be indifferent to which platform has the most native apps available, as long as they can access hundreds of thousands of HTML5 apps.

**Delivering an Experience**

Smartphone makers have a much wider range of innovation possibilities than their PC counterparts. The personal nature of mobile phones and their potential uses offer a wide scope for developing distinctive handset models targeted at a specific segment of the smartphone market.

Handset makers can capitalize on this to lower the risks involved in developing smartphones. Rather than developing generic devices designed to compete head-on with market leaders such as the iPhone and the Samsung Galaxy SII, manufacturers may choose to cultivate a range of smartphones designed to perform a specific task. This is already happening. For example, Sony maximized its Xperia Play smartphone for gaming, while Amazon has tightly integrated its Kindle Fire tablet with its digital entertainment services.

Certainly, designers of operating systems and semiconductors will continue to play an important role in smartphone development. But innovation will likely come from many different parts of the ecosystem. The most successful smartphone manufacturers will create distinctive models with user interfaces that meld hardware and software in a compelling way. Delivering a great user experience for a specific segment of the market could prevent a smartphone from becoming a commodity, and profit margins on smartphones would not necessarily shrink to the wafer-thin levels seen in the PC market.

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**Authors**

Axel Freyberg, partner, Berlin
axel.freyberg@atkearney.com

Hoonjin Hwang, partner, Seoul
hoonjin.hwang@atkearney.com

Laurent Viviez, partner, London
laurent.viviez@atkearney.com

Jan Stenger, principal, Frankfurt
jan.stenger@atkearney.com
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