

Deconstructing “the Smartphone”

Bits Versus Electrons

Deconstructing “the Smartphone”

By Bob Frankston

As exciting as “smartphones” may be, the parts are far more than the whole. The excitement is understandable. Mobile devices have evolved to the point where computing is now personal and always available. Mobile is what I call “marketecture”—putting together disparate concepts into a neat package that defines a market.

Digital technology, as demonstrated in the Internet, has given us the ability to remix technologies and concepts in a way that was much more difficult in the analog world, in which we had to depend on every element of a system being set just right.

Cellular telephony began as a neat hack that took advantage of the properties of frequency modulation in which the stronger signal would dominate (Figure 1). Thus, you could reuse the same frequency band in nearby regions or cells. Today’s cell phones are a long way from the original analog signaling and are really digital packet radios typically using frequency hopping.

The 1990s saw a number of efforts to take advantage of cellular technology for

data services. Just as modems were used to repurpose the phone network for data, cellular digital packet data allowed cellular facilities to be used to exchange data.

Simon from IBM, Nokia, and others built devices to take advantage of these facilities using portable computing devices. Handheld device markup language along with wireless access protocol gave users the ability to access online services within the presumed limitations of the cellular network and the computing capabilities of the devices.

The 1990s also saw the rise of the personal digital assistant (PDA)—the Palm Pilot. Microsoft developed Windows

most people stuck with more standard phones that had limited browsing capabilities.

The Blackberry took a different approach and was positioned as a corporate tool that could tie into companies’ e-mail systems and provide secure access with a great user experience. Apple’s introduction of the iPhone represented a fundamental shift in the market with its focus on user experience and the idea of selling applications just like they sold music. In fact, rather than thinking about it as a phone, it might be better to think of the iPhone as an iPod that happened to include telephony as an application (Figure 3).

The iPhone was initially positioned as a closed platform, and Apple treated apps like it did the music sold through the iTunes store. Bowing to market pressure, Apple opened the platform to third-party developers.



FIGURE 1. IBM’s Personal Communicator introduced in 1994.



FIGURE 2. Early smartphones, such as the Kyocera 6035 and HP iPAQ, allowed users to access information over cellular networks.

Consumer Electronics (CE) devices as a competing offering. I consider the Kyocera 6035, shown in Figure 2, to be the first smartphone. It was a cellular phone built around the Palm. It even included a Web browser and could also be used to connect a laptop to the Internet.

Other manufacturers developed phones (such as HP’s iPAQ) based on Microsoft’s Windows CE platform, which, over time, displaced Palm in the market. While these devices were very useful for those of us who were excited by computers,

could reuse the same frequency band in nearby regions or cells. Today’s cell phones are a long way from the original analog signaling and are really digital packet radios typically using frequency hopping.¹

The 1990’s saw a number of efforts to take advantage of cellular for data services. Just as modems were used to repurpose the phone network for data, CDPD (Cellular Digital Packet Data) allowed the cellular facilities to be used to exchange data.

IBM, Nokia and others built devices to take advantage of these facilities using portable computing devices. HDML (Handheld Device Markup Language) and along with WAP (Wireless Access Protocol) gave users the ability to access online services within the presumed limitations of the cellular network and the computing capabilities of the devices.

The 1990’s also saw the rise of the PDA (Personal Digital Assistant) – the Palm Pilot. Microsoft developed Windows CE (or Pocket PC) devices as a competing offering.

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If you can you should read the [IEEE Version](#) of this article where it is better formatted and also provides the IEEE with feedback about readership.

Note that my previous article is “[Internet of Things Versus the Access Model](#)”.

As exciting as smartphones may be, the parts are far more than the whole. This excitement is understandable. The mobile devices have evolved to the point where computing is personal and available. “Mobile” is what I call marketecture – putting together disparate concepts into a neat package that defines a market.

Digital technology, as demonstrated by the Internet, has given us the ability to remix technologies and concepts in a way that was much more difficult in the analog world in which we had to depend on every element of a system being set just right.

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Apple's introduction of the iPhone represented a fundamental shift in the market with their focus on user experience and the idea of selling applications just like they sold music. In fact rather than thinking about it as a phone it might be better to think of it as an iPod that happened to include telephony as an application.

While it was initially positioned as a closed platform, market pressure led Apple to open up the device to third party developers though with many restrictions. Apple treated apps like they did the music sold through the iTunes store.

Bowing to market pressure Apple opened the platform to third party developers.

Google's Android platform followed in the path of Apple though with far less control over what developers could do. *Google also took the lead in adding sensors and other capabilities that made the devices suitable for a wide range of new applications*

Companies providing the platforms expect to be rewarded with continuing revenues both from their stores and also from advertising revenue based on watching users' behavior. In some ways this continuing relationship is a throwback to the days when Ma Bell owned your phone.

Phones First

We've come a long way from the early PDAs. The current devices are powerful computers in their own right but because they are so, well, mobile, they are increasing integral to people's lives. Though we use the term smartphone the telephone function is just another application.

Yet that function still defines the business model because the phone companies must make a profit ahead of all others. Next in line are the application store owners.

This is very different from the personal computer which was purchased and fully owned by the user.

To put it another way, the smartphone is a device locked into a rent-seeking business model. That brings great value to a phone company or platform provider but it makes it difficult for others to thrive. This limits the ability of the consumer electronics industry to think outside these boxes. It's not even a very good long term strategy for the providers of the technology. We see manufacturers continuing to try to make their devices more and more appealing to their
Deconstructing "the Smartphone"/[Bob Frankston](#) 2



user bases as, to use Samsung's tagline, a "Life Companion" rather than finding entirely new markets.

Beyond Phoning Home

In my January 2013 column I gave the example of lions wearing collars that used cellular technology and GPS units for tracking. The problem is that even though the cellular phone is used simply as a radio one has to pay a monthly fee because it uses a provider's facilities. Thus an application like tracking cows becomes too expensive.

Of course the cow herders can build their own towers and avoid the monthly fee. In fact each community can build their own infrastructure but that is very expensive and creates no additional value.



Moreover once we have such an infrastructure it would make little sense to continue to charge for cellular

phones while allowing all other radios to be used without such a fee.

Closer to home and far more mundane is my alarm clock. In 1981 I bought a nice digital alarm clock. It's amazing that it has taken more than three decades to find a suitable replacement. That replacement is just an application on a generic hardware platform, AKA, a cell phone. But it isn't the one I carry with me because I want a dedicated device sitting by my bedside. I simply bought a used phone that was able to use a desk mount I already owned. In the physical world having a device in the right place with the right form matters.



Fortunately I'm able to use this device without having to pay a monthly fee and don't need to pay for the very latest features and performance.

Hardware as a Service vs. Innovation

It's easy to understand the appeal of hardware as a service. It allows the manufacturers to capture the value of hardware rather than having to accept thin margins for commodity hardware – even if that hardware is very powerful and very far from a traditional commodity.

The consequences for the industry as a whole are to limit innovation to variations on the theme defined by the service providers. Where would personal computing be if Intel continued to set the rules for how we used their CPU? Where would telephony be if we were never allowed to connect our own devices or modems?

Innovation as a technique can only get us so far. We need the raw materials and the ability to disrupt the status quo. The raw materials are there in abundance.

In the example of tracking animals we saw that having the physical infrastructure available as a resource would create immense opportunities. Today's cell towers are basically expensive toll booths for mobile traffic. Without the need to collect a toll for each bit we would be able to take advantage of existing Wi-Fi capacity and add more capacity at a low cost. Just imagine how much capacity would become available! Also, as I wrote my [July column](#) unfettered connectivity is essential if we are to have an "Internet of Things".

Unbundling the device also means that we are no longer tied to the physical device but can move our persona to any device. We see forms of this on Android and Windows tablets which allow you to logon and bring in your personality from the cloud. You can then choose the form and function of a device as needed rather than having to make a two year investment in just one option.

The ability to use interactive (touch surfaces) as well as visual interfaces (such as Microsoft's Kinect) provide new possibilities which we've only just begun to explore.

Instead of GPS we can think of making location information first class information. Once we stop thinking about these as special purpose devices we can think of each of these capabilities in its own right and discover new possibilities and create entirely new industries.

Today creating a new device takes a huge capital investment that requires justifying each application before it is implemented. As these devices become available we'll see rapid exploration of what we cannot imagine but can discover by accident.

We are at a transition point for the industry. The companies producing today's products face a challenge in coming to terms in a software defined world.

It's easy to understand why the companies providing the facilities we use to communicate and the hardware we use to build devices would be reluctant to share the value created using their facilities. Yet imposing such limitations is the modern version of monopoly control preventing the very innovation that drives our economy.

If we are to realize the future, we need practices and policies that make the abundance available to all by having business models that align with the future. A first step is a modern version of the Carterfone decision that would require our devices be sold as open devices without being forced to buy them as smartphones from service providers. And the facilities we do use to communicate must be paid for once, and then made available to use just as we do sidewalks. We need to remember the importance of hardware as something you pay for once and then really own.

We need to move beyond the winner-take-all framing of everything "as a Service" and progress towards a future in which we can all be contributors and winners.

ⁱ I presume the IEEE will fact check this portion because it has a readership that will care a lot.