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SNS
SPECIAL LETTER:
DEMOCRATIZING COMPUTING:
CELLPHONES AS THE NEW
COMPUTING PLATFORM

By Sailesh Chutani

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New Heads and Hands: I am looking for a new Executive Assistant, and for a person or program to sell SNS site licenses to global corporations; details on both are in the "In Other House News" section of this letter.

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Save the Date – the Second Annual FiReGlobal : West Coast conference will be held on November 11th, at the Fairmont Olympic Hotel, in Seattle. You can register early at Preferred Member rates here:

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[**We are currently seeking FiReStar companies for FiReGlobal : West Coast –** companies that are making a positive impact on the world, and which need and deserve notice. Please contact Sharon Anderson-Morris at sam@stratnews.com if you wish to nominate your, or another, company.]

"You are really doing a great service to the world by showcasing such a variety of frontier ideas, and you seem to take some chances, which is also great to see. I've given talks and attended annual SoCal, TED, and Renaissance meetings, and yours creates the best atmosphere for an exchange of ideas in a professional yet easygoing atmosphere." – *James Fallon, Chief Scientific Officer, NeuroRepair Inc., a selected FiReStarter 2010 company.*

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Publisher's Note: Our members have watched the industry strategic energies move over time from fewer users of more powerful machines, to a global base of users of many types of less-expensive computing and communications devices. It is almost fair to wonder about the cart and the horse: do cellphones improve the economics of emerging poor, or do those moving from poverty to basic, consumer-level incomes buy more technology? The answer to both is a clear "Yes."

Just as the wildfire-like adaptation of spreadsheets changed corporate power structures forever (and reduced a couple of management layers), so today do we see technology flattening the power structures, politically and economically, worldwide. As most nations move from a Push societal structure to a Pull structure (unless you live in a communist or Islamist country), this bottoms-up, on-demand participation profile will create lasting change. These changes are already evident in income, in culture, in politics, in attitude, and in healthcare. Central to all of these, in developed and emerging nations, is the cellphone. And, although "smartphones" (with full-on computing power) remain currently stuck in the wealthier demographics, I have never considered unit or retail price a barrier in the technology world. Rather, it's just a small pause.

Sailesh Chutani is a brilliant entrepreneur who is in the middle of these changes, and I can't think of anyone better-suited to describe them. Luckily, he agreed to share his views with our members. – mra.

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➢ Democratizing Computing:
Cellphones As the New Computing Platform

By Sailesh Chutani

Personal computers democratized computing by pushing it out of data centers and into offices and homes. They created a new ecosystem and generated a tremendous amount of wealth for the dominant players in that ecosystem, Microsoft and Intel being among the most well-known. But they still left billions of potential users untouched, because they were too expensive, or too complicated, or both.

All of this began to change a few years ago, as cellphones started to take over the world. With the arrival of the iPhone, people realized that phones – especially smartphones – were really computers, masquerading as phones.

Smartphones are powerful computing devices indeed. They have more computing power than PCs did three to four years ago, but in some ways are even more interesting than PCs, and could change our lives in ways that are far more dramatic than those brought about by PCs.

They have their limitations – namely, a limited ability to enter data and the smallness of their screens – but these are likely to improve due to the billions of dollars being spent by the industry.

These limitations, however, are not slowing down the cycle of disruption of the PC-based ecosystem by the cellphone-based ecosystem. As the smartphone platform evolves to support hardware extensibility, and becomes powerful enough to develop line-of-business applications, it will further accelerate the disruptive cycle; I will explore this premise in further detail below.

[Some disclosures are in order. I was 10 years at Microsoft in several roles, including a brief stint in the Windows Mobile group. I am also the co-founder and CEO of Mobisante Inc., an mHealth company building point-of-care diagnostic devices based on smartphones. I have also just finished writing a book, *Technology at the Margins*, that looks at how information technology – especially cellphone-based technology – can help address the problem of development in emerging economies. The arguments I present here are informed by and colored by these experiences.]

Smartphone: Personal, Affordable, and Accessible

For a typical user, the smartphone has some attractive characteristics vis-à-vis the PC:

- It is extremely portable and usually always with the user – it is truly personal computing.

- It is usually connected to the network.

- It can be recharged anywhere in the world, independent of electrical grid.

- People find it less daunting and easier to learn and use.

- Being voice-based, there is no prerequisite that the user be literate. In addition, economy of scale is operating in full force in the phone industry; phones are improving really fast and also coming down in cost with massive production volumes.

The total cost of smartphone ownership, even when including data plans, is significantly lower than that of PCs and will decrease further as telecommunication companies offer multi-tiered pricing, as AT&T has started to do in the U.S. The advent of managed applications and application stores has reduced the risk of viruses and the cognitive overhead of managing the device – points sometimes missed by critics of the iPhone model. People have discovered the joy of running different applications on their favorite smartphone. The power of the device is almost unlimited, since it can access any number of sophisticated services running in the cloud.

The smartphone is also becoming a mediator between the individual and the world. All kinds of interactions – whether social, commercial, professional, or intellectual – are getting mediated through some sort of application running on smartphones. And we are just scratching the surface on the potential of personalization and customization. The level of information about a user that exists in a smartphone is quite unprecedented, and could be a powerful tool to create experiences specific to the needs and tastes of the user. This would ultimately make the devices easier to use, and more useful.

The only real design constraints around innovation in smartphones may be the size of the user's pocket and limited battery life. Some of the more enterprising road warriors have almost substituted their laptops with smartphones, but not quite. The input methods are still cumbersome, and the output is limited to small screens, although that limitation may disappear with the advent of Pico projectors.

One can also foresee a "docking" architecture emerge, whereby the phone is docked in an office, home, or hotel room to a larger screen, keyboard, and power source. These trends would be accelerated by shared, seamless storage services in the cloud which are accessible from PCs as well as from smartphones. When that happens, smartphones will essentially start to substitute for laptops. Any computational limitations of these devices is offset by pushing heavy number crunching to the Cloud, or Internet-based services running in massive data centers with access to potentially unlimited computational cycles.

The Next Innovation Wave

We are already seeing a wave of PC- and Web-based applications which have been adapted to work on the mobile platform, thereby increasing their reach as well as their accessibility. The process is similar to what we witnessed when client-server architecture-based applications were adapted to the Web.

We can also see the beginning of two additional waves of innovation: 1) line of business (LOB) applications that are specifically designed for the cellphone platform; and 2) specialized hardware accessories that connect to the phone, be it docking devices, medical or environmental sensors, sophisticated barcode readers, or such.

In environments where cellphones are the only viable computing platform available. such as most of the emerging markets; or where affordability, connectivity, and portability are important, we are more likely to see cellphone-based LOB applications emerge. As the variety of hardware accessories that connect to a smartphone increases, we will see a corresponding multiplier in applications as well.

The concept of specialized hardware accessory is not as new or as radical as it sounds. Handspring pioneered it almost a decade ago on its PDAs, which could be expanded in functionality by adding specialized hardware modules.

We illustrate these possibilities by looking at the phenomenon of mHealth [mobile-device-supported medical and public health services – *Ed.*] or use of mobile devices in healthcare to increase access, affordability, and quality of healthcare.

The Cellphone As a Platform in Healthcare

Mobisante is one example of a company that is building a specialized medical device on top of a smartphone. It has developed software that allows a Windows Mobile smartphone to connect to an ultrasound probe via USB, in effect turning it into a fully functional, portable ultrasound system. It uses the computing power of the phone to process and render images, and the built-in cellular or Wi-Fi radios to transmit data. The result is a system that is extremely portable, connected, and affordable, which brings ultrasound imaging within reach of more than 70% of the population that doesn't have access to it today.

But for Mobisante, and other pioneering companies in this space, this is just the beginning. They will be able to add more and more sophisticated medical sensors to their platforms for providing a broad range of diagnostics. This becomes a very powerful tool in the hand of a healthcare worker or a medical professional. As costs come down further and more expertise becomes embedded in the devices, these diagnostic capabilities would be placed in the hands of individual patients. By doing so, we would in effect have a "black box" for the human body, which allows for monitoring of human health as well as sickness, on a continual basis. The data so collected can be published to a patient's personal record, allowing caregivers to intervene as necessary,

since phones are two-way communication devices; and to examine historical trends. Such data collected across populations could also give real-time information on developing epidemics.

WellDoc is one example of a company that is using these ideas to dramatically lower costs in how we manage chronic diseases such as diabetes and asthma, by enabling patients to monitor and report their readings and their caregivers to adjust treatment based on this information. Eventually, when sensors can communicate to the phone seamlessly, no user input would be required, reducing a big class of patient data-entry errors.

And Johnson & Johnson BabyCenter, for example, is using low-tech but universally available SMS messaging [texting] to provide timely messages and information to pregnant women so they can better manage their and their babies' health. Foundations such as the Bill and Melinda Gates Foundation see cellphone-based medical applications as key to providing healthcare in the emerging world; the Gates Foundation has run one of the Grand Challenge Explorations specifically targeted at mHealth. Other companies, including Voxiva, have built cellphone-based data collection systems for healthcare organizations to do disease surveillance.

In a similar vein, some companies today are building environmental sensors using smartphone-based systems, as well as disaster monitoring stations. They are able to deal with the battery life constraints by coupling them with additional energy sources – for instance, solar panels. These trends will accelerate if the device OEMs start to take this segment seriously, although today there are several obstacles to realizing this vision.

Plug-and-Play Accessories

Using the phone as a computing platform is not without challenges. Designing sophisticated workflows for a small screen is inherently difficult. Furthermore, there are multiple application models in play, and choosing any one of them makes a port to the other architectures hard. The tools and expertise are not as widely available as in the PC ecosystem.

It is also very challenging to design for a low-power consumption environment. While Bluetooth accessories such as earphones are quite common, it is difficult to connect accessories to phones through USB, especially if the accessory requires power from the device. Very few phones today offer USB host functionality that enables accessories to draw power from the phone. Most OEMs turn it off to maximize battery life, even though the chipset and operating systems typically support it. There is no universal plug-and-play protocol, à la UPnP in the PC world, that guarantees interoperability, discoverability, and a seamless experience of connecting peripherals to a phone. This lack of extensibility architecture for hardware accessories is slowing the pace of innovation.

If you look back at the evolution of PCs, many of the most innovative features – e.g., webcam, speakers, etc. – first made their appearance as accessories that connected to the PC via a well-known interface, such as USB, FireWire, and similar standard connections. The pace of innovation of accessories was much faster than that of PCs. As certain accessories established their value to users, they became incorporated into the PC itself. (For example, today it is hard to find a PC or laptop that doesn't have a built-in webcam or speakers.)

The common hardware innovation path is still for the OEMs to embed the innovative hardware in the device. In some ways that is attractive, since high volumes reduce the cost dramatically. In other ways it slows things down, since it takes 18 to 24 months to bring a new phone to market. And since it has to appeal to the masses, only innovations expected to have broad appeal make it in. Hardware extensibility architecture would change all that by decoupling the trajectory of handsets from the accessories and tapping into a larger ecosystem of innovators.

Industry Landscape

Let us look at some of the key players to see who in the industry has grasped this potential and is best placed to capture the resulting value.

Apple is keeping a pretty tight control on the hardware. It has developed proprietary hardware connectors that any accessory maker is required to license at a steep fee. Hardware and accessories also make Apple a lot of money. Traditionally, it has not been keen on the prospect of partners developing hardware for its devices. It is happy to continue to stimulate innovation in software applications.

BlackBerry is also a relatively closed architecture, at least so far. Google could certainly encourage the hardware extensibility trend through Android. There would only be an upside for Google in doing so.

As of today, Microsoft's Windows Mobile, along with Nokia's Symbian, are the only companies that provide USB host support for peripherals; but ironically, Windows Mobile is moving away from that in its quest to be a fast follower to the iPhone, thus giving up a serious competitive advantage.

Symbian tools are less developer-friendly compared with those of its competitors. However, if Microsoft ports Windows to run on ARM architecture, that would change the landscape overnight, since support for peripherals is deeply integrated in Windows, and the developer community is huge.

Microsoft recently announced a licensing deal with ARM. Perhaps this is a signal that it is serious about running Windows on ARM chips. If it does, it won't be without precedent, as Windows historically has supported both the MIPS and x86 architecture. Smartphones are a very competitive category, with tremendous price pressures. Pure software players such as Microsoft have serious challenges, since their business models

of licensing software just doesn't work in this space – margins are too small. For Microsoft, this challenge will remain even if it begins to run Windows on ARM chips. It may be able to capture more of the value by supporting and developing accessories, as it has done with Mice.

The Wintel ecosystem is also trying to create devices that approach smartphones in most critical aspects. It can't compete with ARM-based systems on power consumption yet, but Intel continues to invest quite heavily to address those issues. There is also a possibility that there is a "good enough" threshold for power efficiency – and if Intel chips achieve that, they don't have to be as good as ARM-based systems. Such devices are more likely to have support for accessories because of their legacy.

Some OEMs, like Hewlett-Packard, seem to have concluded that one way to have a high-performance mobile device is by controlling hardware as well as software, as is the case with Apple and RIM. This is perhaps the motive for HP's acquisition of Palm, which gives it WebOS. Whether this move will result in it having an open accessory architecture remains to be seen.

The Democratization of Computing

Smartphones are displacing PCs as the most common computing platform, and in doing so, are finally bringing the benefits of the IT revolution to the masses. They are also becoming powerful enough to provide the platform for sophisticated line-of-business applications.

Once smartphones develop an extensible hardware architecture that permits "plug and play" accessories, that transformation will be complete and will disrupt the PC ecosystem.

We can also expect to see pure mobile line-of-business application players emerge that will become category leaders in the way that Amazon, Salesforce.com, SAP, Oracle, and Intuit became leaders following a new computing paradigm. These innovators may ultimately create more value than those providing picks and shovels of the new ecosystem, and they are quite likely to come out of the emerging economies.

All of these trends and changes, added together, will ensure the continued growth of the cellphone industry's strategic importance worldwide for the next decade at least, and perhaps much longer.

About Sailesh Chutani

Sailesh Chutani is the CEO and a co-founder of Mobisante Inc., an mHealth company building cellphone-based, affordable, and easy-to-use ultrasound systems. He was until recently a senior director at Microsoft in Windows Mobile. Prior to that, he managed $100m worth of exploratory research and development in Microsoft Research in emerging technologies to identify and seed new businesses. The results included the formation of multiple new product and business units within Microsoft, such as robotics, technology for emerging markets, education products, and many others, including a startup spin-off, Zumobi.

Sailesh pioneered Microsoft's engagement in personalized medicine, bioinformatics, and systems biology. He was an early visionary who championed cellphone technologies in healthcare, especially to meet the needs of the under-served segments of society. The research that he initiated starting in 2005 is now bearing fruit and migrating out of research labs into commercial products and attracting extensive interest from foundations and investors.

Sailesh's passion lies in commercializing advanced technologies to serve critical market needs. He was a key player in creating and building a successful startup, Transarc Corp., which was spun off from a research project at Carnegie Mellon University and sold to IBM. Two of the technologies developed at Transarc became billion-dollar businesses for IBM and Microsoft. He has had business and technical leadership roles in companies such as Hewlett-Packard, Oracle, and Microsoft. He has also managed multiple P&Ls and executed successful turnarounds. He has advised several Silicon Valley startups on their business and product strategy, and governmental and non-governmental agencies on their innovation and intellectual property strategy. He has served on the advisory boards of the American Society for Engineering Education and the University of Michigan.

Sailesh has a Ph.D. from the Swiss Federal Institute of Technology, Lausanne, Switzerland; an MS from the University of North Carolina at Chapel Hill; and a BTech from the Indian Institute of Technology at Kanpur, India.

I want to thank Sailesh for taking the time from a very busy schedule launching his fascinating new company, Mobisante, which was featured as a FiReStarter company at FiRe 2010.

Your comments are always welcome.

Sincerely,

Mark R. Anderson

CEO
Strategic News Service LLC   Tel. 360-378-3431
P.O. Box 1969   Fax. 360-378-7041
Friday Harbor, WA 98250 USA   Email: sns@tapsns.com

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➤ **About the Publisher**

Mark Anderson is CEO of the Strategic News Service. He is the founder of two software companies and of the Washington Technology Industry Association "Fast Pitch" Forum, Washington's premier software investment conference; and has participated in the launch of many software startups. He regularly appears on the *CNN World News*, CNBC and CNBC Europe, Reuters TV, the BBC, Wall Street Review/KSDO, and National Public Radio programs. He is a member of the Merrill Lynch Technology Advisory Board, and is an advisor and/or investor in OVP Ventures, Ignition Partners, Mohr Davidow Ventures, the UCSD Calit2 Laboratory, the Global Advisory Council of the mPedigree Network (Ghana), SwedeTrade, The Family Circle (Europe), and the Australian American Leadership Dialogue.

Mark serves as chair of the Future in Review Conferences, SNS Project Inkwell, The Foresight Foundation, and Orca Relief Citizens Alliance.

➤ **Where's Mark?**

On the evening of September 22nd, Mark will moderate a panel on Cloud Computing for the **MIT Forum**, in Seattle. ● On October 6th, Mark will keynote the 25th Anniversary meeting of the **Puget Sound Venture Club**, in Seattle. ● From October 26th to 28th, he will be hosting panels at the third annual **Family Office Circle** meeting

on Cyberwar, the North American Economy, and Mobile IT, in Heidelberg, Germany. ● On November 11th, Mark will host the second annual **FiReGlobal : West Coast** Conference, at the Fairmont Olympic Hotel, in Seattle. ● On December 9th, he will be hosting the sixth annual **SNS Annual Predictions Dinner**, at the Waldorf=Astoria Hotel, in New York.