Wearable computing: opportunity or threat?
Lane Rettig - Technology Strategy - December 19, 2013
Word Count: 1215

Executive summary

This paper answers the question, how should incumbent technology giants Google, Apple, and Microsoft respond to the dual opportunity and threat introduced by wearable computing? Wearable devices are likely to have an even higher adoption rate than cellular phones. They offer an enormous opportunity, but also an enormous threat, to incumbents. If incumbent firms are able to maintain their enviable positions atop their relative value chains, or expand the scope of those value chains into wearable, it represents a competence-enhancing innovation and the firms stand to benefit enormously. The paper examines Google Glass as a case study, and concludes with recommendations for these incumbents to profit from this innovation.

Diffusion models

According to Pew Research Center, 91% of American adults now own cell phones, which were introduced commercially in 1984. Contrast this with the century it took fixed-line phones to achieve saturation. Pew has called the cellular phone "the most quickly adopted consumer technology in the history of the world." [1]

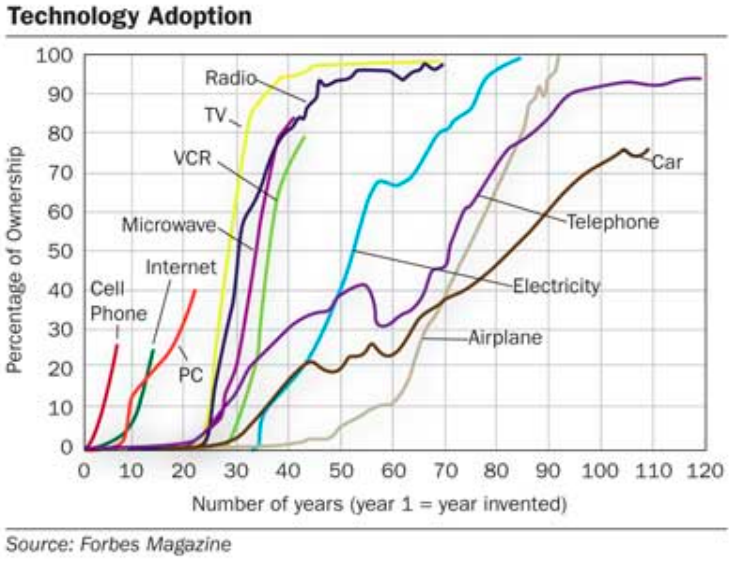

Exhibit 1: Technology diffusion curves for consumer technologies. While dated, this graph shows the incredible diffusion speed of cellular telephony.
Source: Forbes Magazine via http://kk.org/thetechnium/archives/2009/05/increasing_ubiq.php

[1] Rainie, Lee. "Cell Phone Ownership Hits 91% of Adults." *FactTank: News in the Numbers*. Pew Research Center, 6 June 2013. Web. 18 Dec. 2013. <http://www.pewresearch.org/fact-tank/2013/06/06/cell-phone-ownership-hits-91-of-adults/>.

The cellular telephone achieved such rapid adoption because it scores highly on nearly all of Rogers' Five Factors. Google Glass, the first viable general purpose wearable computer, demonstrates these characteristics to an even greater extent:

- **Relative advantage:** Glass offers all of the features of a modern smartphone, with additional functionality such as native handsfree control and recording of POV images and video. The current voice- and tap-based interface is still unwieldy but will evolve quickly.
- **Visibility:** Glass is even more visible than a cellular phone, and has been featured in media and the popular press, and is a hit among celebrities.
- **Trialability:** As with cellular, this is its weakest point. Glass is currently expensive and not widely available. However, Google has already begun addressing this problem by launching a national tour to demonstrate the device,[2] and by renting space in major cities to distribute it (and potentially to allow trials).[3] The price is widely expected to fall quickly.
- **Simplicity:** Because of its voice-based, natural language command system, Glass is simpler and more intuitive than a cellular phone. One can learn the basics in under five minutes. The product will become more complex over time, but the interface will also improve.
- **Compatibility:** Glass is small, light, and easy to wear. It has been successfully tested in a variety of applications, including walking, driving, skydiving, and complex medical procedures.[4,5] Glass can be worn anywhere an ordinary pair of eyeglasses can be worn. Because it runs the Android operating system, there are already millions of applications that could run on Glass with some modification, and millions of developers familiar with the platform.

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[2] Kerr, Dara. "Google Glass Hits the Road with a US Tour." *CNET News*. CBS Interactive, 26 Sept. 2013. Web. 19 Dec. 2013. <http://news.cnet.com/8301-1023_3-57604885-93/google-glass-hits-the-road-with-a-us-tour/>.
[3] Lardinois, Frederic. "Google Glass Isn't Coming To Best Buy Next Year, And It Won't Cost $299." *TechCrunch*. N.p., 23 Aug. 2013. Web. 19 Dec. 2013. <http://techcrunch.com/2013/08/23/google-glass-isnt-coming-to-best-buy-next-year-and-it-wont-cost-299/>.
[4] "Google Glass at Ohio State's Wexner Medical Center." *The Ohio State University Wexner Medical Center*. The Ohio State University, n.d. Web. 19 Dec. 2013. <http://medicalcenter.osu.edu/mediaroom/features/Pages/Google-Glass.aspx>.
[5] Orlin, Jon. "How Google Pulled Off Their Live Video Skydiving With Glasses Demo."*TechCrunch*. N.p., 28 June 2012. Web. 19 Dec. 2013. <http://techcrunch.com/2012/06/28/how-google-pulled-off-their-live-video-skydiving-with-glasses-demo/>.

Exhibit 2: Rogers' Five Factors and Cellular vs. Wearable

Why Glass, why now?

Google has likely chosen to invest in Glass now for two distinct reasons. First, it leverages existing capabilities in mobile hardware and software, operating systems, platform strategies, and human-computer interaction. It is unclear exactly how much Google has invested in the project. However, given the $50mm+ invested earlier this year in Himax Display Technologies, a component supplier for Glass,[6] and the amount being invested in Calico, another Google X project,[7] it can safely be assumed to be on the order of hundreds of millions. In all probability, Glass represents at least 5% of Google's $7bn R&D budget, and potentially much more.[8] The firm genuinely believes that wearable computing is the future of mobile.

The second reason, also discussed in class, is for the incidental value the project has for Google's brand, its existing products, and its human resources. Many of the brightest technologists Google

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[6] Cooper, Daniel. "Google Buys 6.3 Percent Stake in Google Glass Display Manufacturer Himax." *Engadget*. N.p., July 2013. Web. 19 Dec. 2013. <http://www.engadget.com/2013/07/22/google-investment-himax-display-glass/>. Also, calculations based on Yahoo Finance data.

[7] Primack, Dan. "New Details on Google's Anti-aging Startup." *CNNMoney*. Cable News Network, 09 Oct. 2013. Web. 19 Dec. 2013. <http://finance.fortune.cnn.com/2013/10/09/new-details-google-anti-aging/>.

[8] United States. Securities and Exchange Commission. *Form 10-K*. Google, Inc., 31 Dec. 2012. Web. 19 Dec. 2013. <http://www.sec.gov/Archives/edgar/data/1288776/000119312513028362/d452134d10k.htm>.

seeks to hire want to be associated with a firm actively engaged in exciting, innovative projects, including Glass and the driverless car. Furthermore, the enormous publicity surrounding Glass provides a huge amount of free marketing for the Google brand, which will have positive incidental effects for other Google products, and for the Android OS more specifically. Given the $500mm Google is spending on marketing for one new product alone, the Moto X,[9] this has real value to the firm.

Advice to incumbents

Despite all of these advantages, Google still faces the challenge of being a first mover. In line with industry dynamics as studied in class, the wearable computing industry has seen an enormous number of entrants in the past two years. These include large, well-established incumbent firms such as Sony, Apple, Microsoft, and LG, as well as numerous startups. How should Google and these other established incumbents respond to the dual threat and opportunity posed by this new technology?

In the same way that Slim CRT and LCD displays were competence-enhancing innovations for Samsung, Google Glass in its current form is a competence-enhancing innovation for Google for one critical reason: it runs Android. Because of its enviable position at the top of the mobile computing value chain, Google has enormous influence over the development and distribution of Android-based mobile hardware and software. As long as this ecosystem remains intact, these complementary assets give the firm an enormous advantage in wearable computing.

The dominant design for wearable computing has yet to emerge. Many competing designs have already appeared, from wristwatches to HD glasses to specialized HUD devices. For the greatest chance of dominating the wearable ecosystem, Google should continue to invest heavily in its Android-based solution. It should generate interest among developers and ensure the availability of a wide variety of compatible apps, which it has begun doing through its Explorer program and the open Google Mirror API. It should also collaborate with hardware manufacturers to produce different wearable devices also based on Android, as it has with Sony's SmartWatch.

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[9] Chan, Casey. "WSJ: Google Is Spending $500 Million to Advertise the Upcoming Moto X." *Gizmodo*. N.p., 10 July 2013. Web. 19 Dec. 2013. <http://gizmodo.com/wsj-google-is-spending-500-million-to-advertise-the-u-738560168>

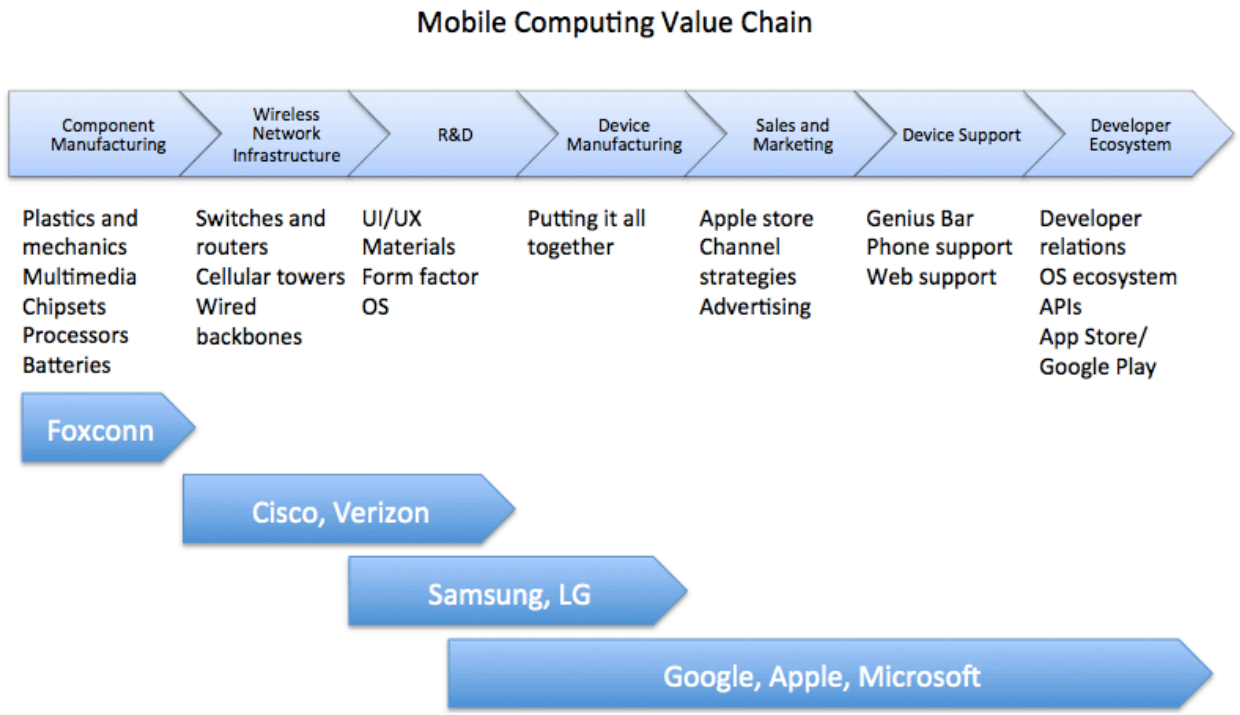

Exhibit 3: The mobile computing value chain. Google, Apple, and Microsoft control not only a large portion of the chain, but also the highest value-add and most profitable portions.

From the perspective of Microsoft and Apple, if the mobile platform war is not yet over, the wearable platform war has only just begun. While Microsoft has failed to innovate dramatically in hardware since the Xbox, its mobile OS has rapidly improved and its user base has increased significantly. Wearable could be an opportunity for Microsoft to overtake its rivals, if it can release a compelling piece of wearable hardware based on an OS with a thriving developer community. Apple, for its part, also stands to win back a portion of the mobile market that it has lost to Android if it can introduce a wearable iOS-based device with a user experience as simple and compelling as that of its other products.

Finally, these firms must not overlook the threat of an entrant introducing a radically different product that becomes the dominant design. Most dangerous would be a new operating system, which could completely undermine the complementary assets described above and potentially turn wearable into a competence-destroying innovation for these firms. Several contenders, such as Flora[10] and Viking,[11] have appeared. Each of the incumbents should look to partner with, invest in, and ultimately acquire strong contenders. This, indeed, is precisely the strategy Google took when it acquired Android, Inc.

[10] http://www.adafruit.com/flora
[11] http://www.brilliantservice.co.jp/viking/