

## WHAT IS, ACCORDING TO YOU, THE DEVICE OF THE FUTURE?



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The device of the future will be defined as much by how it is made as by what it does, and also by whom it serves. We are at a critical juncture in history -- perhaps the most important since the Industrial Revolution -- when it comes to examining how devices can be made, and by whom. And because devices can now be made differently, their functions can also change. Where once devices configured us as consumers, we can now develop devices that configure us as citizens.

Most of material culture in the "global north" is created by companies or corporations and sold to consumers and governments. For over a century, the consolidation of resources into companies or bureaucracies seemed to be the most efficient way to produce goods or services. Innovation happened by such company producers, which through the power of their scale could marshal labor and capital, knowledge and expertise. By housing these resources in the same legal regime -- and often the same building -- companies could thus reach large economies of scale. The original model for this was the medieval university, which similarly aggregated people and books, and was incorporated beyond the lifetime of an individual. This system worked extremely well in the sense that alternative models did not compete well. Individual producers or small collectives, from small farmers in Poland to textile producers in Italy, have gradually been replaced by companies of various sorts. One key difference between individual producers (craftsmen, inventors) and larger (company) producers is that the former usually created goods for themselves, as well as for trade. Companies typically produced goods for consumers, not primarily for their own use. Of course, all goods that a company produces represent an averaging of consumers' needs with the company's own needs (i.e., cost of production, planned obsolescence, responses to competitors, and many other factors). The ascendant hegemony of company producers has been so complete that is now difficult for first world citizens to touch anything in their daily lives that was not fabricated by a company.

Even as the ascendance of companies is nearly complete, we live in interesting times, where communications costs have plummeted. The invention of telephony, and more recently, the Internet, has produced a world where sharing knowledge and coordinating labor is now almost without price. In the example of the university, it is now common for a scholar's closest collaborators and intellectual peers to be separated by vast distances. There is no cost of time in communicating with distant peers, in contrast with the 'community of letters' that flourished during the Enlightenment. Moreover, the library, or accumulation of mediated knowledge, is quickly being replaced by online sources of information. Regardless of who wins the many intellectual property battles that are now being fought, more and more information is available free of charge, and can be accessed anywhere in the world.

This shifting communications landscape has led to a playing field where innovation in devices can now happen via teams of distributed collaborators who are not bound by static economic and legal entities. Increasingly, collaborators will work on projects that are in their interest because the collaborators will use the device themselves, rather than expect to sell the device. This has happened most fully in the realm of software, in part because distribution costs of software are trivial -- it is almost the same to release one or one million copies -- but

also because the design of software can be extremely structured and can take advantage of cheap tools for enhancing distributed collaboration. Of web sites that you visit, roughly three quarters will be served by some sort of free/open server, not designed or manufactured by a company, but of far greater worth and infinitely better value than one that had the investment and backing of one of the richest corporations in the world. Increasingly, we will see the success of distributed public domain collaboration in many other areas, far beyond software.

What does this mean for the device of the future? I argue that there are several major implications. Most importantly, many significant projects that have been developed according to free software principles may start as a way of serving only their authors -- the authors design for use, not just for sale -- but then become quite generally used. One project in my research group was developed by a Lebanese student, Ayah Bdeir, who suffered inappropriate searches when she travelled through British and American airports. In response, she developed an undergarment that used advanced composites, a tiny computer, and miniature batteries to record how she was searched. Her garment was undetectable to airport employees or metal detectors. No corporate engineering team would ever develop such a product: the market is too small and the use of the device too politically contentious. But small groups of potential users around the world can collaborate on the design and its improvement, and have them locally manufactured. Bdeir has become a leading light in the new open hardware movement.

Markets fail in many situations. In the United States, returning war veterans who have lost a limb are often fitted with high tech, state-of-the-art prosthetics; one unit may cost as much as the average US annual household income. Unfortunately, only a small percentage of soldiers receive lifetime veteran health benefits. Because of this cost, the majority of war veterans end up using prosthetics -- simple metal hooks with cables -- that were patented in the 1910s. Almost no innovation has happened in the realm of prosthetics for actual amputees, because the market is small, and amputee consumers have relatively small incomes. Distributed, collaborative design processes afford the opportunity to redress this market failure. A group called the Open Prosthetics Project, run by engineer veterans, has assembled a collaborative team to make modular, 'hackable' prosthetics that can be manufactured and tailored at the local level. Because they are user producers, they do not need to recoup their costs. Rather, they need to improve their lives, and specifically their ability to earn money in other jobs. This is motivation and reward enough for their significant innovation.

As devices no longer need a large corporation's power to be produced and distributed, we will see many more devices that serve needs for which there is no mass market. The kind of unique voice that we expect in literature, music, and the visual arts will be heard in products, where now only corporate voices are heard. Today's devices overwhelmingly serve the most powerful in society: large companies and governments. Cheap communications allow for other, less powerful members to co-design their own devices, creating new genres in the process. But cheap communications aren't guaranteed. In much of the world (most of the global South) they are not widespread, nor a significant influence in the economy, even as many people living in these countries are systematically under-served by markets and would disproportionately be served by collaborative user innovation. Around the globe, rights to free and open communications are under threat.

What, then, is the device of the future? I would argue that it is closer to what you need as a citizen and human being, rather than to what you need as a consumer. More haiku, less Hollywood. But we have learned from the free software movement that vested interests will do nearly anything to try and prevent this future. Attempts to maintain monopolies in the media and medicine, with intellectual property and copyrights, and with distribution networks will only lead to information and communication scarcity. If these monopolistic efforts succeed, we will not see the development of new and innovative devices. It will take hard work to ensure that regressive laws and policies designed to prevent this future are not passed. But the work will be worthwhile. Allow yourself to imagine: What do I truly need? You will soon see that devices in today's market are offering far too few answers to that question, and far too many answers to the wrong questions.